PRODUCT DIVERSIFICATION AT THE FIRM LEVEL : AN EMPIRICAL ANALYSIS

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by

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to the

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DECEMBER, 1985

DEDICATED TO

MY

LOVING PARENTS

CERTIFICATE

This is to certify that the thesis "PRODUCT DIVERSIFICATION AT THE FIRM LEVEL : AN EMPIRICAL ANALYSIS" submitted by Mr. Prakash Narayan Bajpai in partial fulfilment of the degree of Doctor of Philosophy to the Indian Institute of Technology, Kanpur is a record of bonafide research work carried out under our supervision and guidance. The results embodied in the thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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H-Eco 736 Industrial Organization and Policy

H-Eco 737 Development Economics

H-Eco 739 Price Theory

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CONTENTS

SYNOPSIS

PRODUCT DIVERSIFICATION AT THE FIRM LEVEL : AN EMPIRICAL ANALYSIS

- A thesis submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy by Prakash Narayan Bajpai to the Department of Humanities and Social Sciences, Indian Institute of Technology, Kanpur, December 1985.

There has been a growing trend toward extensive corporate diversification into related as well as unrelated products since the mid 1960s. This phenomenon has generated increasing interest among economists as well as policy makers towards an analysis of its extent, causes, and consequences.

This study attempts a quantitative analysis of (a) the extent and pattern of diversification, and (b) the underlying causal factors.

To measure diversification a profile of the sales of products at the 4-, 3-, and 2-digit level of the National Industrial Classification 1970 for years 1974 through 1979 was constructed. This was accomplished by deleting internally consumed products to avoid vertical relationships. Nine quantitative indices were calculated to measure the degree of diversification of the firm. Data for a total sample of 140 firms from twelve different industries was assembled for the analysis.

An examination of the computed values of diversification by different indices revealed the following salient features:

(a) On an average, the number of industries in which the sample companies were active is small relative to the possible extent of conglomerate diversification. However, the primary product of an average firm accounts for only about 64 percent of the total output.

(b) A substantial portion of the diversification has been of the conglomerate type; that is, across the broader 2-digit industries.

(c) A typical firm has a large proportion of its output in one or two product groups while the rest of the output is distributed over a large number of related as well as unrelated products.

(d) There is a significant variation in the average diversification propensity among firms in different industries. Similarly, firms in different industries vary in their choice of related and unrelated products.

(e) Firm level diversification increased between 1974-79. But the rates of growth across different industries indicate marked differences.

An attempt was made to extend the Penrosian hypothesis regarding the predominance of firm specific internal factors in the choice of the pattern of diversification. For greater generality the model was extended by integrating Gorecki's specific asset hypothesis. To operationalize this approach to the identification of the determinants of diversification,

the firm is considered as a collection of highly specific internal resources. There will be an underutilization of some of these resources in the growth process of the firm as their productivity increases and their activities become routinized. As such, excess capacity may arise in several functional divisions of the firm. This, in turn acts as an incentive for diversification.

The literature on diversification also indicates that certain external and market determined influences can spur the firm to such a strategy. These factors have also been taken into account in an attempt to build a comprehensive model of the determinants of diversification.

In particular, we propose the following hypotheses:

(a) The greater the under utilization of managerial skills the greater would be the diversification.

(b) The greater the capacity utilization rate of the existing productive capacity the lower would be diversification.

(c) The size of the firm would be positively related to diversification.

(d) The degree of diversification would be positively correlated with economies of scope.

(e) The availability of internal finances, measured by the shareholders' reserves and surplus, is more likely to exhibit a positive relationship with diversification.

(f) The profitability of the firm, measured by the rate of return on capital employed, has a direct relationship with diversification.

(g) Advertising intensity has a positive influence on diversification since such diversification enables the firm to utilize its marketing channels more fully.

(h) An increase in the concentration of the market for the primary products of the firm will induce an increase in diversification.

(i) The growth rate of the primary industry of the firm has an ambiguous effect on its diversification.

(j) The institutional factors, mainly the regulatory legislations (of which we consider only the Monopolies and Restrictive Trade Practices Act, 1969), may affect diversification either way.

An attempt was made to examine the validity of these hypotheses by utilizing cross-section regression analysis for industry specific samples as well as pooled samples.

The results obtained from the analysis support the viewpoint that firm specific variables are more important in explaining the observed levels of diversification. Managerial excess capacity, advertising intensity, as well as capacity utilization rate, were found to be significant, validating the general hypothesis of underutilization of specific assets as the major source of diversification.

Among the external and market related factors, it was found that (a) economies of scope, given the technology and asset structure, (b) firm size, and (c) concentration in the primary product market, are significant. The growth rate of the primary industry does not appear to have affected the choice of diversification strategy. The results with respect to the other variables are inconclusive.

The empirical results also suggest that the explanatory power of the causative variables and the overall significance of the estimated equations is significantly affected by the choice of the index of diversification. Further, it appears that the 3-digit level of industry classification is not useful for a study of diversification.

On the whole, the major analytic argument can be summarized in the following manner. Certain technologies and their production and cost economies are such that large quantities of a single product or a well defined combination of products must be produced to fully exploit their efficiency. The firm may not be in a position to utilize this at any given moment of time either due to lack of market demand and/or prohibitive regulations such as the MRTP Act. In either case it may attempt to generate greater revenue by diversifying, even into unrelated areas. Regulatory policy aimed at reducing market concentration should be evaluated against the loss of efficiency inherent in such technological processes.

LIST OF VARIABLES

DI	Industry Count Index of diversification
DS	Secondary Specialization Ratio Index of diversification
DG	Gort Index of diversification
DB	Berry Index of diversification
NE (DB)	Numbers-Equivalent corresponding to Berry Index
DU	Utton Index of diversification
DE	Entropy Index of diversification
NE (DE)	Numbers-Equivalent corresponding to Entropy Index
DT	Gravity Index of diversification
SAL	Company Size
SRS	Shareholders' Reserves and Surplus
RRC	Rate of Return on Capital Employed
MEC	Managerial Excess Capacity
ADI	Advertising Intensity
EOS	Economies of Scope
CUR	Capacity Utilization Rate
GR3	Growth Rate of the Primary Industry
CON	Concentration in the Primary Industry
MRT	Dummy Variable

NOTE: The diversification index followed by a number indicates the level of industry classification at which it is calculated.

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CHAPTER 1

INTRODUCTION AND PROBLEM SETTING

1.1 CORPORATE GROWTH AND DIVERSIFICATION

In the past, especially in the 1950s, the growth of many firms was mainly in one or a few products. Some firms chose this approach since they had to consolidate their position in existing markets to ensure their growth. Several other firms did not want to jeopardize their immediate profit and growth potential by going in for new products, especially in areas where they had little or no experience.

The situation changed considerably from about the mid 1960s and diversification was recognised as an essential prerequisite of the corporate growth process. According to Chaudhuri et al. (1982) the diversity score[1] for a sample of 72 large firms increased from 2.8 to 5.8 during 1960-75. Similarly, during the year 1979, 77 out of the top 100 public limited companies in the private sector were diversified. This trend appears to be gaining further momentum with the passage of time. Consequently, there has been a growing interest among economists, managers, and regulatory agencies in the phenomenon of diversification of established firms into new and related product markets.

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1. The diversity score is defined as the number of discrete businesses in which a firm is involved - where a discrete business is one that can be managed independently of the firm's other activities.

1.2 TRENDS IN DIVERSIFICATION

The present study considers a firm to be diversified if it produces two or more products belonging to different industry codes of the National Industrial Classification 1970 at the 4-digit, 3-digit, or 2-digit levels. Product diversification has been extended to related as well as unrelated fields. For example, Delhi Cloth and General Mills (DCM), which initially produced textiles and sugar, now covers more than 30 different products including fertilizers, PVC resins, and electronic items. Kelvinator moved from refrigeration equipment to scooters, mopeds, electronic desk calculators and various other items.

In most cases diversification into related product lines was systematic in the sense that firms attempted to base it on their inherent strength in either production or marketing. Generally, an increase in the pace of technological changes in the developed economies resulted in such changes being introduced in our corporate sector as well.[2] The following examples are representative:

(a) Many firms in the textile industry had to move into synthetic fibres and yarn due to latter's superior performance.

(b) Larsen and Toubro, for instance, diversified into technologically related fields of electrical equipment and heavy

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2. To some extent, the increased pace of technical change shortened the life cycles of the existing products and created the need for greater diversification and adaptation.

engineering.

(c) Jyoti Ltd. extended its activities from electrical equipment to alternative energy devices.

(d) Firms, such as, Calico and Standard Mills, initially diversified into production of chemicals used in the textile industry. Subsequently, this familiarity with the continuous process technology was extended to the manufacture of other chemicals.

Flexibility in the import of technical know-how and liberal policy of collaborations with foreign companies resulted in cases of totally unrelated diversification. For instance,

(a) WIPRO Products, a producer of vanaspati and soaps, ventured into computer industry.

(b) Lohia Machines expanded into the manufacture of scooters from yarn and textile machinery.

Some firms appear to have reached a maturity stage with respect to the life cycles of the existing products (products of jute industry provide the most common example). As a consequence the existing product lines did not offer a satisfactory scope for further development. Apart from the physical assets and technology even the marketing skills were temporarily underutilized. The marketing skills could be applied relatively easily to different products. This resulted in both related as well as unrelated diversification.

Rallis and Voltas experienced this type of diversification.

In sum, diversification was sparked off by one or more of the following factors: (a) technological relatedness, (b) foreign technology and collaboration with foreign companies, (c) learning effects of technology, (d) improved utilization of marketing skills and channels, and (e) managerial innovations.

In addition, the following factors also had a catalytic effect:

(a) Improvements in the management climate and the adoption of new management techniques enabled the corporate sector to sustain bigger and more diversified firms.

(b) Diversified portfolio and financial base provided the ever increasing need for finances.

(c) Governmental regulations provided a selective impetus to diversification.

Diversification - irrespective of the type - can be achieved in a variety of ways. Prominent among them are:

(a) mergers and acquisitions

(b) internal development or growth.[3]

It appears that the major diversification strategy of most of the firms in the corporate sector has been through internal

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3. Another way of venturing into new product lines is through buying patents or operating under licence. They can then be used for building up internal strength. Japan's industrial growth exemplifies this type of development (see, Ozawa 1980). Many firms in our corporate sector have also been adopting this procedure.

development. For, it is widely believed that internal development enables firms to improve efficiency by

(a) taking advantage of economies of scale,[4]

(b) the more rapid application of new techniques (first mover advantages), and

(c) the introduction of managerial innovations.

Each of these aspects was such as to make diversification an important structural determinant of the firm's performance because allocation of resources could be improved beyond what the market for any product allows. Such a structural development, to the extent it is empirically significant, also makes the phenomenon of diversification far more analytically tractable within the framework of the theory of the growth of the firm.

1.3 SOME ISSUES REGARDING DIVERSIFICATION

One of the foremost questions in any study of diversification concerns the quantitative evaluation of the extent of diversification. Several measures have been developed in the literature.[5] It would be worthwhile to examine their relevance in our context so that appropriate measures of diversification can be brought into focus.

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4. In the case of diversified firms, it should be taken to relate to the entire operations of the firm instead of the conventional single product.

5. None of these measures make the conventional distinctions (horizontal, vertical, conglomerate) in economic theory of the types of diversification. The specific form of diversification does not seem to be affected by or affects the growth of the firm differently.

The extent of diversification is changing over time. It would therefore be important to examine the variations over time within a firm. Similarly, the patterns of diversification across firms within an industry exhibit significant variations. It would be necessary to initially obtain a quantitative notion of these differences.

At a second level, it would be important to isolate the actual factors which account for the extent and nature of diversification within a firm and industry. Inter-firm as well as inter-industry differences can have significant implications for public policy aimed at industrial growth. An insight into the determinants of diversification may also enable us to make certain positive and normative comments on this increasing element of market structure.

The extent and pattern of diversification have implications for the growth of the firm as well as its market performance. For, diversified firms can increase concentration and exercise considerable market power. On the other hand, they are also in a position to make a better use of both actual and potential resources. An understanding of even this aspect may be important in public policy debates.

In general, the following aspects of product diversification at the firm level need extensive analysis:

(a) the nature and extent of diversification,

(b) the quantitative magnitude of diversification,

(c) the motivating forces which account for the observed diversification, and

(d) the effects of diversification on the conduct and performance of firms.

1.4 THE NEED FOR FURTHER ANALYSIS

The major studies on diversification have so far been Gort (1962), Berry (1975), Amey (1964), Lemelin (1982), Caves et al. (1977, 1980), Gorecki (1975, 1980), Hassid (1975), Wolf (1977), and Macdonald (1984). These studies concentrated mostly on industry averages for the measurement of diversification. Similarly, they considered the product market characteristics as the major motivating factor of diversification. Such industry level studies failed to focus attention on the differences across firms within the same industry. Specifically, such studies confined themselves to the analysis of origin and target industry's features which are expected to influence diversification decisions.

We are, on the other hand, concerned more with the identification of the characteristics of the diversified firms. In particular, the determinants of diversification at the firm level deserve more attention. Some studies which have attempted to analyse firm related determinants of diversification, have admittedly used data bases not particularly suitable and reliable. Furthermore, analyses of the determinants in these studies suffer from the lack of any

general explanation for diversification.

In the context of our corporate sector, very little effort has been made to study this aspect of diversification. Only a few sporadic attempts have been made to document the extent of diversification[6] and reveal its pattern. Occasionally, a few comments are available regarding the factors responsible for diversification. Even in these studies the major emphasis has been on the role of governmental regulatory policies. See Dhingra (1970) and Chaudhuri et al. (1982).

The details of the substantive as well as the methodological aspects of the important studies will be presented in the next chapter. However, it should be noted here that a study of the firm-level motivations for diversification is still in order.

1.5 EMPHASIS OF THE PRESENT WORK

This thesis makes an attempt to gauge the extent of diversification, register changes therein between 1974-79, and reveal its pattern for a sample of public limited companies in the private manufacturing sector. The focus is on the firm level diversification in contrast to industry level studies. Furthermore, specific quantitative measures of diversification will be employed. These different measures will be utilized to judge their suitability, as there is little conceptual

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6. Such documentation has been only qualitative in nature.

basis for ascertaining the a priori superiority of any one of them. Also, in contrast to most previous studies, the data base used will be particularly well-suited to the measurement of diversification. Especially, by making use of the product-wise sales profile of a firm for computing diversification, we will be able to derive more accurate measures. It will also enable us to omit vertical relationship to a large extent, which has vitiated previous studies.

However, the major emphasis is on the determinants of diversification. In particular, the thrust would be on the identification and analysis of the factors which affect the degree of diversification. The main concern will be with firm specific characteristics. In addition, the scope of the analysis would be enlarged by introducing primary industry-specific variables and institutional factors.

On the theoretical side, antecedents of this aspect of the problem can be found in Coase (1937), Penrose (1959), Marris (1964), Barna (1962), and Rubin (1973). In fact, the theoretical framework of this study owes much to Penrose's and Gorecki's (1975) contributions to the theory of diversification. However, whereas Penrose has predominantly emphasized the role of the idle managerial resources as far as internal inducements to diversification are concerned, we submit that such idle (excess) resources may very well arise in other functional areas of the firm. In a similar vein, Gorecki's 'specific asset' hypothesis- not very different

from Penrosian view in content - has put more stress on the advertising and research and development generated resources. By integrating the two views and expanding it further, our model of diversification will have certain new variables in addition to those quite well established in the past work.

Thus, among the firm specific characteristics which are presumed to have a causal link with diversification, hypotheses based on managerial excess capacity, advertising intensity, economies of scope, spare physical capacity, availability of financial resources, and the firm size will be specified and tested.

The effect of institutional factors on the degree of diversification is sought to be analyzed by using the Monopolies and Restrictive Trade Practices Act applicability on the firm as a catch-all proxy for various governmental regulatory policies. Additionally, the effect of external conditions on diversification will be seen by including the firm's primary industry[7] variables; viz. concentration and growth rate.

In general, let D(K,I) be the degree of diversification of firm K given that its principal activity is in industry I. Then, the following model of diversification will be utilized.

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7. The primary industry of the firm, at the given level of classification, is the industry accounting for the highest proportion of its total output.

$$D(K,I) = f [W(K), X(I), Y(E)]$$

where

W(K) is a vector of characteristics of firm K;

X(I) is a vector of characteristics of industry I, the firm's primary industry, and

Y(E) is a vector of institutional characteristics.

The extent of diversification would generally appear to be low at the 2-digit level of aggregation. Hence, the analysis of the determinants may indicate only a few variables as important. However, at a further disaggregate level, such as the 4-digit level of classification, firm specific variables would become far more important. The models would be developed at different levels of classification to highlight this aspect.

Given certain inherent differences among industries, it is reasonable to presume that some of the firm-specific variables will not be significant in the case of particular industries. Therefore, the analysis will be done for five different industries for which data coverage is complete and the sample is reasonably large. Subsequently, the entire sample will be pooled and the model extended by introducing additional variables for the purpose of the empirical analysis.

1.6 OUTLINE OF THE STUDY

The rest of the thesis is planned as follows. Chapter 2 deals with a review of the empirical studies on the measurement and determinants of diversification. Chapter 3 is devoted to

the development of the model of determinants of diversification, formulation of testable hypotheses, and their empirical specification. Chapter 4 outlines the sample selection and nature of sample firms. Chapter 5 then presents the level of diversification and its pattern for the sample firms. Chapter 6 specifies the framework for the empirical analysis. Chapter 7 examines the industry specific results of the statistical analysis of the determinants of diversification. Chapter 8 reports and discusses the empirical results for the entire pooled sample. Pertinent conclusions and the main findings of the study are reported in chapter 9.

CHAPTER 2

MEASUREMENT AND DETERMINANTS OF DIVERSIFICATION: A REVIEW

2.1 EMPIRICAL APPROACHES TO THE MEASUREMENT OF DIVERSIFICATION

Approaches to the development of measures of diversification can generally be classified as

(a) quantitative measures, and

(b) qualitative approaches[1].

Attempts to develop quantitative measures of diversification classify the products of a firm (manufactured as well as marketed) into various industrial groups. The most popular of such schemes of classification has been the Standard

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1. Additionally, some stock-market based measures of diversification have also been suggested. Such measures generally consider the degree of diversification as a direct function of the amount of residual unsystematic variation that remains in a combination of risky assets held by a firm. See, for example, Barnea and Logue (1968). A variant of such a measure can be found in Maas's and Hutchins (1973). However, we find that such measures entail both conceptual and practical difficulties and, therefore are unsuitable for application. For example,
   (a) These measures are based on the restrictive assumption of relatively perfect capital markets.
   (b) Such measures reflect the market estimate of the intrinsic diversification within the firm, assuming that the market collectively and correctly acts upon its relatively perfect information concerning the intrinsic product and market diversification of the firm in question. This, however, need not be always accurate.
   (c) These necessitate using stock-market related variables in computation of indices. Mostly, such data are not available on a continuous basis. Moreover, these indices cannot be used at all, if a diversified firm is not listed with a stock exchange.

Industrial classification.[2] For any given classification, measures of diversification take into account various aspects of the output of the firm. Generally, the following aspects of the firm's range of products have been considered:

(a) The number of separate industries in which a firm operates, say N. The maximum value of N will depend on the classification followed.

(b) The quantitative importance, to the firm, of each of the N industries over which it allocates its output. The relative importance of any of the N industries is represented by P_i, the proportion of the output of the firm in the ith industry. These proportions are usually ranked from the largest to the smallest, such that $P_i \geq P_{i+1}$ for all i.

(c) The distance or difference between the products as reflected in the technological or market homogeniety. This can be significant even if all the P_i's are identical.

Most studies of diversification take the product characteristics (a) and (b) into account and develop a summary index. In particular, Gort (1962, pp. 23-26) defined a number of measures of which the following two are quite widely

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2. Reference here is to the US Standard Industrial Classification (SIC), which served as a basis for many studies. However, of late, most of the industrialized countries have developed their own classification systems, as a need was felt to conform classifications to various peculiarities of their industries. Such classifications, usually, differ with regard to number, size, and composition of industries included, depending on the underlying assumption employed in the classifications.

used. The first, the Industry Count (DI) is defined as the number of industries in which a firm is active. DI varies between 1, for a specialized (non-diversified) firm and N, where N is the maximum number of industries in which the firm produces. The index, DI, although easy to compute, does not take cognizance of the relative importance of different products of the firm. However, since most of the firms do not divide their output equally among different industries[3], this index will generally be biased upwards. This would be more so in the case of firms operating in industries where by-products and complementary production relations obtain.

The second index suggested by Gort, which has been used extensively in the industry level studies, is the Secondary Specialization Ratio, DS. It is defined as the ratio of non-primary output[4] of a firm to its total output. Formally,

$$DS = \frac{S}{P+S}$$

where, S is the secondary or non-primary output and P the primary output.

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3. See, for example, Berry (1975, Table 4-4, p. 65) and Gorecki (1978).

4. The primary output of a firm is its output in the industry (at a given level of industry classification) accounting for the highest proportion of its total output. Such an industry is defined as the primary industry of the firm. The firm's non-primary or secondary output is the remainder of its output.

The lower and upper limits of DS are $0 \leq DS \leq (N-1)/N$. The upper limit of DS is found when the firm spreads its output equally among N industries. In such a situation DS has a "Numbers-Equivalent"[5]:

$$NE(DS) = 1/(1-DS)$$

As a measure of diversification DS does not make an attempt to consider the relative significance of the N-1 non-primary industries. Thus both DI and DS deal with a single dimension of the size distribution of a firm's output.

Gort (1962) combined DI and DS to obtain a composite index of diversification. The Gort index can be written as,

$$DG = N \left(\frac{S}{P+S} \right)$$

where, N, S, and P have been defined earlier. So defined, the Gort index is bounded between 0, and N(1-1/N). However, for given N, P, and S, even this index is unaffected by the relative importance of the firm's N-1 non-primary production lines.

An index of diversification defined by Berry (1975) gave weight to the non-primary production lines as well. Based on the Herfindahl index of concentration, Berry's index is defined as

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5. Numbers-Equivalent is defined as the number of industries in which the firm must allocate its output equally (i.e., $P_i = 1/N$, for all i) so that any given value of an index is generated.

$$DB = \sum_{i=1}^{N} P_i^2$$

where, P_i is the proportion of output in the ith industry and N is the number of industries in which the firm operates. To make it increase with an increase in the degree of diversification, it can be modified as

$$DB = 1 - \sum_{i=1}^{N} P_i^2$$

Thus, Berry's index will vary between zero, for a specialized firm, and 1-1/N for a firm which divides its output equally among N industries. This index emphasizes the relative sizes of the output of the firm's activities instead of the number of products in which it deals. Further, the index takes a value 1-1/N when the firm is equally active in each of the N lines of production. Thus, the numbers-equivalent, which can be written as

$$NE(DB) = \frac{1}{1-DB}$$

can be utilized to have an idea about the relative diversification across firms.

The Berry index has its limitations despite the fact that it takes all the products of the firm into account. Firstly, this index will underestimate diversification when certain products of the firm happen to be in the initial stages. That is, when the production has still not reached the capacity level. Secondly, the same value of the index

may be obtained for the different distributions of the firm's productive activities. For example, DB = 0.48, if the distribution is $P_1 = 0.60$, $P_2 = 0.40$. But the same value of DB can also be generated by the distribution $P_1 = 0.70$, $P_2 = 0.10$, $P_3 = 0.10$, $P_4 = 0.10$. However, Gorecki (1978) asserts that the number of distributions which can yield a given value of DB is far fewer than those which give the same value to the indices DI and DS.

Subsequent efforts in this direction resulted in indices which used different weighting systems. Utton (1977) put forward an index which utilizes rank orderings of the firm's products. The primary product of the firm is assigned the rank 1 and all the remaining non-primary products are ranked in a descending order. The Utton index then weights by i the proportions P_i. Thus, it is defined as

$$DU = 2 \sum_{i=1}^{N} i P_i - 1$$

So defined, the index DU is a weighted average with the different activities of the firm weighted by their relative importance as indicated by their rank. The Utton index has two useful properties. First, it will be bounded by 1 for a single-product firm and N for a firm with its activities spread equally in N different industries. Secondly, any value of DU can be interpreted as a numbers-equivalent. For example, DU = 2 would mean that the firm is diversified to a degree equivalent to one operating equally in two

industries. However, this advantage can also be looked upon as a limitation. For, two different distributions relating to the firm's output may yield the same value of the index. (For example, the distribution A: $P_1 = 0.6$, and $P_2 = 0.4$ and the distribution B: $P_1 = 0.7$, $P_2 = 0.2$, and $P_3 = 0.1$ yield the same value for the Utton index.)

Hexter (1975) and Jacquemin and Berry (1979) extended the entropy measure of concentration to the measurement of a firm's diversification. The entropy index is defined as

$$DE = \sum_{i=1}^{N} P_i \ln 1/P_i$$

where, P_i and N have the usual meaning.[6] This index takes a value zero when N = 1 and a value ln N when the output is equally divided among N industries. This index can be decomposed in such a way as to indicate the contribution of diversification at each level of product aggregation[7] to the the total. Specifically, it can be shown that

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6. A corresponding direct measure can be written as $\pi_i P_i^{P_i}$ or simply the reciprocal of the antilogarithm of DE as defined above. See Marfels (1971).

7. Industrial classification systems invariably define economic activities at varying levels of industry classifications. Thus, a 2-digit industry would encompass many 4-digit and somewhat fewer 3-digit industries. In other words, the number of industries would increase with the increasing fineness of the level of the classification.

$$DE_T = \sum_{s=1}^{S} P_s (DE_W) + DE_A$$

where, DE_T = total diversification at the 4-digit level (i.e.; at the disaggregate level)

P_s = proportion of the sth 2-digit industry

DE_W = 4-digit diversification within the sth 2-digit group

DE_A = diversification at the 2-digit level across 2-digit industry groups.

The first term in the above expression is a weighted average of the firm's 4-digit diversification within each sector (commensurate with the broader level of classification) with each sector weighted by its relative importance (P_s). The second term is the diversification of the firm across 2-digit industry groups. Hence, by "knowing the entropy index of diversification for a firm at the 4-digit level, and also at the 2-digit level, a weighted average diversification at the 4-digit level within those 2-digit industries is therefore correspondingly defined." (Jackquemin and Berry (1979, p. 362)). Thus, this index can be used to see how much diversification at the detailed level of classification is a consequence of diversification across those broader product groups.

Additionally, Hexter (1975) suggested that the entropy measure is more appropriate for ascertaining the information loss due to consolidated financial reporting in a diversified firm. He also recommended the use of the antilogarithm of entropy, which is the numbers-equivalent in the case of entropy

index, since the calculated values of the entropy index are not easy to interpret.

The most comprehensive of the quantitative indices is the one used by Caves (1975) and Honeycutt and Zimmerman (1976). The 'gravity index' takes into account all the three dimensions of the firm's size distribution of the products mentioned at the beginning. Thus, this index also seeks to take note of the degree of dissimilarity among the firm's output along with the usual attributes of the Herfindahl (Berry) index. This is accomplished by modifying the Herfindahl (Berry) index so that a greater weight is assigned to those industries that are more distant. The gravity index can be defined as

$$DT = \sum_{i=1}^{N} P_i \sum_{j=1}^{N} d_{ij} (P_j)$$

where, P_i and P_j are the product proportions in the ith and jth industry, and d_{ij} is the weight signifying the distance from industry i to industry j.[8] The flaw in this index is that the weighting system is based upon the industrial classification system. Consequently, the 'distances' between the pairs of industries will be affected

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8. Honeycutt and Zimmerman (1976) used the following weighting system in their study.

Weight (d_{ij})		Industry i	Industry j
$d_{ij} = 0$	if	20113	20113
$d_{ij} = 1$	if	20113	20114
$d_{ij} = 2$	if	20113	2012x
$d_{ij} = 3$	if	20113	202xx

contd...

by the peculiarities (appropriate or otherwise) of the classification system used. Furthermore, this index may not have much of an advantage in the case of industry specific diversification studies since the 'distance' between the product lines within an industry group is likely to be sufficiently uniform.[9]

Many empirical studies on diversification, which used the above mentioned indices of diversification, employed net output, payrolls, employment or net assets data for calculating the product proportions of the firm in different industries. The use of such data involves many problems. In particular, the failure to omit vertical relationships has been a shortcoming of most analyses. Another problem, which is a more serious one, is that such studies have almost invariably relied on the Census Bureau Statistics. In census of production and other data, the output or employment of establishments producing more than one product, as defined by the official product classification, is generally classified

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(8 contd....)

$d_{ij} = 4$ if 20113 21xxx

$d_{ij} = 4$ if 20113 3xxxx

where x can be any number between 0 and 9.

9. Note that the gravity index collapses to the Herfindahl index at the 2-digit level of industry classification since $d_{ij} = 0$ if $i = j$, and $d_{ij} = 1$ if $i \neq j$. Therefore, if one were to study diversification only at the 2-digit level of classification, then this index would loose its advantage over the Herfindahl index.

under the heading of the principal product of the establishment. Therefore, a precise calculation of diversification from official statistics is rendered impossible. Attempts to circumvent this problem involves making use of different assumptions about the establishment's distribution of output across industries. For further details see Gorecki (1980 b).

The industrial classifications system creates certain biases in the measurement of diversification. Firstly, in some instances, classification systems are based on the differences in the manufacturing processes. In such cases the same products may be classified under two different industry groups. Secondly, if an industry is classified according to market-based criteria there is then a possibility that the similarity of the elasticity of demand would classify two otherwise distinct products in the same category. Thirdly, the measures of distance between different industry groups cannot be claimed to reflect any intrinsic differences between them. Fourthly, at a broader level the conversion of vector valued information to a scalar measure of diversification as well as the actual method of estimation can be questioned on theoretical grounds. See Needham (1969) and Scherer (1971, pp. 67-69).

An alternative approach to the measurement of diversification was initiated by Wrigley (1970) and systematically analyzed by Rumelt (1974). Their method of approach focussed on the individual firm and its distinct pattern of

diversification. As Rumelt (1974, p. 12) remarked; "Each company had a unique history and had developed its own pattern of relationship among technologies, products, and markets. What was a discrete business for one firm was often an integral and non-separable part of a larger business in another firm."

Rumelt's approach to measuring diversification is qualitative in nature. A two-tier classification procedure was adopted to assign a firm to diversification categories indexed 1 to 10. Assignment to a main diversification category was on the basis of the percentage of a firm's total sales (or some other size related variable) that can be attributed to a 'discrete business area'. Further, differentiation is based on the pattern of linkages among a firm's business lines.[10] To Rumelt, a discrete business area (represented by the specialization ratio) is firm specific, and can be defined by marketing, distribution, research and development, technology, production, or some combination of these factors. The 'pattern of linkages' distinction is also highly individualized and incorporates the firm's history when describing linkages among product lines.

Given the variety of factors considered and the depth of analysis, Rumelt's categorization process, it can be argued, should provide a valid assessment of the firm's diversification

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10. An application of this approach in the Indian context can be found in Chaudhuri et al. (1982).

from the corporate point of view. However, in this approach, the extent of subjective judgement seems to have been stretched too far and the very strength of the methodology of considering qualitative as well as quantitative data could become a weakness if category judgements cannot be systematically replicated on an objective basis. Further, the identification of the relevant "soft" data, its acquisition and evaluation can be subjective and, costly. For a further discussion of the disadvantages of this method refer to Montgomery (1982).

On the whole, there is no unambiguous choice of the indices of diversification. The present study attempts to examine a variety of quantitative measures in order to highlight certain similarities and differences.

2.2 THEORETICAL BASES OF THE DETERMINANTS OF DIVERSIFICATION

In contrast to the empirical work on the measurement of and effects of diversification, fewer studies have addressed themselves to the question of its determinants. The choice of determinants in these studies, which mostly pertain to industry characteristics of both the origin as well as the target industry, firm's characteristics, and, at times, certain environmental and institutional factors, is either heuristic in nature or is based on numerous theoretical developments in fields, such as the theory of the growth of firm, literature on entry, business strategy, economies of scale, theory of organizations etc. Despite such developments,

a fully developed theory of diversified firm still remains an elusive goal. As a result, most studies have focussed their attention on one or two aspects of the subject. In the following, an attempt is made to briefly present some theoretical contributions which have been utilized by researchers in the formulation and empirical verification of several hypotheses of causal factors of diversification.

The literature on entry has mainly confined itself to the identification of conditions under which a new firm will enter an industry. It was shown that the most likely industries for entry will be those in which more than average profits can be earned.

However, work in this area does not take into account the differences among the entrants. That is, it is not concerned with the conditions under which a firm will enter an industry in which it is not now engaged. Consequently, firm specific differences among potential entrants are ignored. However, some economists like Bain (1956) seem to be aware of this. For, Bain remarked "It is not realistic to assume that all potential entrants are alike either in their capacity to enter or with respect to the gap which will just induce them to enter." Andrews' (1959) observations are more specific in this context when he points out that some of the problems faced by an entrant, such as acquiring capital, establishing a brand reputation, and attaining economies of scale, are less severe for established firms. In a similar

vein, Hines (1957, p. 135) added another advantage: "An established firm probably has unusually good knowledge of profit opportunities in markets contiguous to its own." Such comments apart, the literature on entry does not seem to have considered firm specific characteristics explicitly.

Nevertheless, this part of the literature has subsequently been used in many empirical studies in the formulation of the determinants of diversification. In particular, the degree of *per se* attractiveness of the target industry has been related to the following features:

(a) growth and profit opportunity,
(b) mode of product differentiation,
(c) complementarity in the use of their products,
(d) use of similar production techniques, and
(e) reliance on science-based research.

Similarly, the growth of the industry of origin and concentration have been specified as the primary industry factors. The above- mentioned factors have also been employed to identify the relationships between the origin and the target industry.

Another part of the industrial organization literature which can be employed to shed some light in this context is the literature on economies of scale. Coase (1937) views the organization of production within the firm as an alternative to the organization by market. He asserts that market organization of production is costly; therefore, firms

will exist and "... tend to expand until the costs of organizing an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange in the open market or the costs of organizing another firm." (p. 341). Robinson (1952) made explicit the advantages and disadvantages of such transactions within the firm. He argues that there are several "optima", that is, most efficient factors; such as, managerial, financial, marketing, and risk bearing. The optimum size of firm can be achieved by a reconciliation of these diverse factors. However, the mere existence of unutilized or potential economies of scale is not sufficient to promote diversification in most instances unless the economies are what might be called economies of scope or diversification. Besides, this approach is not able to explain the continuous growth of the firms through diversification.

The business literature which discusses the question of incentives for diversification is mostly normative in nature. Hence, as such it is unsuitable for describing or predicting the behaviour of firms. Nevertheless, it does give some useful insights on the causal factors behind diversification. A good example of this type of work can be found in Ansoff (1958, 1965) and Pessemier (1966).

The most promising approach to a more general and comprehensive theory has been initiated by Penrose (1959). It has been pursued by Marris (1964), Barna (1962), and Rubin

(1970). These works differ in emphasis and orientation; but they all depend on basically the same model of the firm. The theoretical framework of this research is primarily an extension and application of Penrose's theory. Hence, a detailed discussion of her model is postponed to chapter 3. However, to summarize, Penrose considers the firm as a collection of particular resources worth more to the firm than their market value because of the experience gained by resources in the firm. Some of these resources are normally freed as existing activities become routinized. Unused and/or underutilized managerial resources then search for new activities that will make use of their capabilities. Thus, diversification is the observable outcome of a dynamic internal growth process.

But Penrose did not provide a convincing motivation for the reduction of managerial slack. Marris (1964) filled this gap by the argument that the threat of takeovers and other forms of capital market pressures are adequate to ensure managerial efficiency. Similarly, based largely on Penrosian views, Rubin (1970) has constructed a highly formal model of the diversification decisions of the firm.

Growing popularity and acceptance of the above framework notwithstanding, very few empirical studies appear to have derived testable hypothesis concerning diversification by utilizing the Penrosian model. Among these Wolf (1977) provided an operational expression to this viewpoint and made it more

general. In his view, there are several reasons for the emergence of underutilized resources in various units of the firm. An example of such an underutilized resource would be technical expertise or knowledge within the firm. Since the opportunity cost of these resources is close to zero, they can be exploited to generate additional revenue for the firm. Thus, diversification is an outcome of both the internal stimuli, represented by underutilized resources, and/or external stimuli relating to the prospective markets. But, in the empirical specification, he made use of only technical manpower and firm size as the variables affecting diversification. Thus, his study has failed in bringing out the complete influence of internal factors.

Another empirical study which has sought to offer a general explanation of diversification is Gorecki (1975). According to him a firm may possess a 'specific asset' which can be applied in several industries. The specific asset may be in the form of an innovation, a certain marketing skill, brand image or managerial expertise and experience with a production process. Under these circumstances a firm may either

(a) sell or lease out the specific asset to another firm, or

(b) it may itself exploit the asset by diversifying into industries in which the asset can be employed. The preferred option would obviously depend on the relative profitability of the alternatives, which in its own turn would be affected

by several factors. A general consideration influencing the choice of the diversification option is the likely presence of imperfections in the market for specific assets or their services.

Based on these considerations, Gorecki classifies the determinants of diversification into three groups,

(a) activities of the firm which are likely to produce specific assets,

(b) environmental factors which are likely to facilitate the use of the specific assets, and

(c) factors which are likely to affect the scope of the application of the asset.

However, apart from the differences in the terminology there is really not much difference between the specific asset hypothesis and the Penrosian concept of emergence of unused resources, except that the latter is much more comprehensive.

On the basis of the discussion in this section and empirical studies, the general formulation of determinants of diversification can be summarized as follows:

$$D\ (K,\ I,\ J) = f\ [\ V(K),\ W(I),\ X(J),\ Y(I,J),\ Z\ ]$$

where,

D(K,I,J) is the degree of diversification of the Kth firm, with its primary activity belonging to industry I, and diversified into industry J,

V(K) is a vector of characteristics of firm K,

W(I) is a vector of characteristics of industry I,

X(J) is a vector of characteristics of industry J, into which the firm diversified,

Y(I,J) is a vector of variables describing relationship between I and J, and

Z is a vector of environmental and institutional factors which may affect the variations in the patterns of diversification.

However, none of these variables can be considered to be necessary and/or sufficient if they are viewed in isolation.

Most empirical studies on diversification have analyzed one or two sets of variables of the above stated formulation. One common weakness in these studies is the use of aggregate industry-level data in the absence of firm specific information. See, for instance, Gorecki (1975, p. 133) and Grant (1977, p. 91). However, when firm specific information is utilized, as in the case of Rumelt (1974), the results are significantly different from those derived from using industry aggregates.

2.3 EMPIRICAL STUDIES ON THE DETERMINANTS OF DIVERSIFICATION

In this section, we attempt to review the operational measurement of various determinants of diversification and the results based on their empirical testing. Throughout the analysis, the possibility of a two-way causation should

be kept in view. For example, it has generally been observed that a large established firm may find it easier to penetrate into new product markets owing to its ability to cross entry barriers. However, any resultant diversification, unless offset by a decline in its activities in the existing markets, is bound to lead to an increase in size. Therefore, firm size may both be a cause and effect of diversification.

Secondly, the use of proxies for certain determinants had the effect of producing conflicting results. This can be attributed to the following factors.

(a) Different data sets may contain information regarding different structural characteristics.

(b) The proxy variable may be inadequate or inappropriate to measure the effect which is sought to be captured.

(c) Measured values of the dependent variable, that is, index of diversification may be inaccurate.

Turning to the substantial results of the analysis, it should be noted that firm size, advertising, research and development, and to some extent profitability were considered as the measures of the firm specific determinants of diversification.

Firm size will be generally positively related to the degree of diversification. Gorecki (1975) maintains that smaller firms are likely to be less diversified for several reasons. Firstly, smaller firms, which have a limited

resource base, are likely to be mainly pre-occupied with establishing themselves in a single product line before attempting to diversify. Secondly, smaller firms are likely to have greater difficulty in raising funds for expansion into other markets. Under such conditions the smaller firm, even as it has an underutilized specific asset, is prone to wait until it becomes larger or to lease the use of the specific asset to another firm. As Wolf (1977) pointed out, larger size may offer advantages, other than economies of financing as well.

The size variable has been used in almost every empirical study. The measures of size utilized are familiar ones, viz., net assets, payrolls, employment, sales, and output etc.

This variable has been found to always show a positive association with diversification. At the industry level, Caves (1977b) found firm size to be a significant determinant of diversification. Similar results were recorded by Gorecki (1975, 1980). However, Utton (1977) did not report a strong direct relationship between diversification and size. Besides, the significance of association appears to have been affected by the choice of the diversification index. Thus, Gort (1962, p. 65) found firm size to be positively and strongly related to DI but not so to DS. On the other hand, Honeycutt and Zimmerman (1976, Table 5, p.529) show both DI and DS as significantly related to diversification though the variable was lagged by 17 years in their study.

Advertising may possibly result in the generation of two types of specific assets which seem to be similar. Firstly, as Gorecki (1975, 1980) pointed out, it may lead to expertise in selling, marketing and product differentiation. Secondly, advertising may be successful in the creation of a strong brand image with respect to a particular product and/or the firm's name. Normally, such a strong reputation would be protected from imitation by various institutional arrangements (trade marks etc.). Since they may not be easily saleable in the market or may involve externalities, diversification will be the route to fully utilize the specific asset so created.

Quite obviously, the influence of advertising generated specific assets on the degree of firm diversification will be dependent upon the extent to which such assets can be transferred to other markets from the one in which it was originally developed.

Grant (1977) emphasizes the role of indivisibilities in marketing and contends that the managerial dexterity in marketing will help the diversifying firm in overcoming entry barriers to other industries based on differentiations. In Sutton (1973), marketing personnel are assigned the role of stimulating search activity for new investment opportunities.

The advertising to sales ratio has often been employed as a proxy for the degree to which a firm can circumvent the entry barriers. However, it is worth noting that a high

ratio may be due to other reasons as well. As such a high advertising intensity is neither necessary nor sufficient to sustain greater diversification.

Empirical results on this variable have been ambiguous in nature. Gorecki (1975) proposed a positive relationship between advertising intensity and diversification but his results indicated a statistically negative coefficient. Similarly, the investigations of Caves (1977b) showed a negative relationship. On the contrary, Macdonald (1984) observed the coefficient on advertising intensity to be positive but not statistically significantly different from zero. A similar conclusion was drawn by Hassid (1975).

Analysis based on the quantitative as well as qualitative measures of diversification, emphasize research and development activity of the firm as an important determinant of diversification. Chandler (1962) for instance, argued that much of the post-war diversification by U.S. firms has been based upon the skills of their research organizations. Specifically, firms with substantial research experience are expected to apply skills in product development and process innovations to new product lines.

Wolf (1977) noted that R and D activities are likely to result in technical expertise or knowledge, on which the firm can earn additional revenues as it diversifies. The new opportunities created by the R and D have the characteristics of a public good and hence, the opportunity cost of using this

know-how in new product lines is close to zero and the resource itself can be considered to be underutilized. To Gorecki (1975), R and D efforts are a potential source for the generation of specific assets such as, an innovation, basic technical knowledge or a new production technique. Diversification is then shown to be the preferred strategy for realising the value of the specific asset because of transaction cost considerations as well as the risks involved in such technology transfer.[11]

Empirical evidence on the R and D variable, often measured in terms of the number of scientists and engineers per given number of employees, is quite substantial. Starting from Amey (1964) many other researchers have obtained a strong positive relation between diversification and R and D. But the nature of the relationship shows significant variation among the studies. Thus, in Lemelin (1982) R and D has been found to affect the direction that firms take in diversification, but it does not influence the extent of diversification into any one industry. Gort (1962, pp. 138-139) and Gorecki (1975, p. 140), on the other hand found R and D activity to be a far more pervasive influence in determining the pattern as well as the extent of diversification. However, Hassid (1975, p. 387) and Macdonald (1984, p. 1108) did not find R and D as a significant variable.

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11. The causation may well be in the reverse direction. See, for example, Nelson (1959), Grabowski (1968), and Link and Long (1981).

The use of profitability of the firm as a determinant can be explained by the fact that diversification requires substantial financial resources and, hence the more profitable the firm, the easier it will be to raise funds externally and/or allocate funds from retained earnings.

Profitability has, however, found limited application in empirical studies. This is because of the fact that most studies happened to be industry-level studies and since growth of the industry and its profitability have been shown to be correlated many researchers found it convenient to employ industry growth in lieu of profitability. Generally, the coefficient of this variable has been found to be weak and with conflicting signs. Honeycutt and Zimmerman (1976), for example, reported insignificant results for the profitability. Similarly, Gorecki (1980) did not observe any significant link between diversification and profitability. In this context, however, Grant (1977) and Macdonald (1984) have recorded favourable results.

Before proceeding further it is important to note that empirical evidence cited so far is almost exclusively from the industry-level studies.[12] In these studies firm specific variables are represented by their corresponding industry averages. But industry averages may not be able to capture

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12. Except Gort (1962), Honeycutt and Zimmerman (1976), and Gorecki (1978) which employed firm-level data in their studies.

individual variations among firms at all. Therefore, strictly speaking, most of the empirical evidence cannot be said to be a true reflection of the effectiveness of firm characteristics in inducing diversification.

Among the industry specific determinants, that is, characteristics of the industry from which diversification takes place, the following have often been considered in the empirical studies:

(a) Concentration in the primary industry, and

(b) growth of the primary industry.

According to Gorecki (1975), the direction and degree of diversification of a firm will be constrained and affected by the extent of concentration in the firm's primary industry. Under normal circumstances difficulties faced by a firm with regard to expansion within an industry will directly vary with the level of concentration. For, expansion in the primary industry to any significant extent is likely to result in a reduction in the market shares of other leading firms which will retaliate by price cutting and/or advertising campaigns. Hence, a positive relationship is predicted between diversification and concentration in the firm's primary industry. Honeycutt and Zimmerman (1976) also pointed out that diversification by firms in concentrated industries is facilitated by their higher profitability in primary industries.

Empirical support for the effect of this variable on diversification is mixed in nature. Gorecki (1980, p. 337) reports a statistically significant but negative relationship between the two. He offers a tentative but highly tenuous explanation for the opposite sign. On the other hand, Hassid (1975) and Honeycutt and Zimmerman (1976) found no significant relationship at all.

The greater the growth rate of the firm's primary industry, other things being equal, the easier it will be for the firm to expand within the boundaries of that industry. Therefore, expansion within the firm's primary industry will not only be easier - in the sense of familiarity with the production process - but will also be a preferred strategy. Furthermore, since several studies have shown that there is a strong direct link between growth of the industry and profitability of the firm[13], this mode of growth may also be more profitable. Thus, Gorecki (1975) asserts that there exists a negative association between the growth rate of the firm's primary industry and diversification.

However, although a firm in a slowly growing or declining industry may have an incentive to diversify, it may not have the requisite financial resources to do so. On the contrary, firms in high growth industries are likely to possess greater ability to diversify, due to the internal funds generated by

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13. See, for example George (1968).

higher profitability which may also result simultaneously in an enhanced borrowing capacity and lower costs of the external funds. The fact that the financial capacity to diversify may vary directly with the rate of growth of the firm's primary industry may tend to offset the expected negative link between growth and diversification.

Gort (1962) observed that low growth in the principal activities of the firm tended to exert a positive influence on their attempts to diversify. A similar negative association between growth rate and diversification is also exhibited by Gorecki (1980). However, Amey (1964), Hassid (1975), and Gorecki (1975) failed to get a statistically significant result for this variable.

A sizeable part of the attention of some studies, notably Rumelt (1974), Lemelin (1982), and Macdonald (1984), has been devoted on highlighting the patterns of diversification. In fact, target industry related variables and variables describing relationships between origin and target industry have mostly been used in this context, especially the latter. However, since all other industries except the firm's existing line of production can be thought of as constituting its external environment, characteristics of the remaining industries and changes therein may be expected to influence diversification to some extent.

Thus, in this regard, variables considered are related to the attractiveness of the target industry. Important among

them are

(a) growth rate,

(b) profitability, and

(c) concentration in the target industry.

The class of variables describing a relationship between origin and target industries, on the other hand, can only provide information on the likelihood of certain industries that may be chosen for diversification but not the extent to which it will be done so.

As far as the effect of institutional determinants of diversification is concerned, there seems to have been no concerted attempts to systematically analyse them. One can only find a few passing references in this context. Therefore, few, if any, generalizations can be offered on the role of institutional factors in influencing diversification decisions.

In the Indian context, very little evidence is available on the issues relating to diversification. Of them, the study by Chaudhury et al. (1982) is most relevant for our purposes. This study made an attempt to ascertain the extent of diversification for a sample of 72 large public and private sector firms by utilizing the qualitative approach to the measurement of diversification and analysed the underlying causal factors responsible for the observed levels of diversification. However, whereas they appear to have taken a note of certain firm specific and external factors, there

is no evidence of a systematic statistical analysis. Thus, by merely plotting a scatter between the degree of diversification and the timing of certain governmental regulatory policies, they arrived at the conclusion that "the major reason for diversification in Indian industry seems to have been the fact that growth possibilities in existing business were blocked not by an interplay of market forces but by governmental regulation" (p. 34) and "... diversification in Indian industry seems to be influenced strongly by governmental regulations and public policy" (p. 36).

However, if it were indeed so, all firms falling under the purview of a specific regulation, such as the Industries (Development and Regulation) Act, should have exhibited reasonable degrees of similarity with regard to patterns and extent of diversification. But the existing empirical evidence does not corroborate this viewpoint. There may be factors, other than regulation, which have a more significant bearing on the diversification decision.

2.4 SOME TASKS AHEAD

In the foregoing, we occassionally pointed toward certain weaknesses in methodological and empirical contents of the studies on measurement of and determinants of diversification. Broadly, the various shortcomings can be related to

(a) the use of inappropriate indices of diversification and/or the use of imprecise methods in the calculation of

measures, and

(b) incomplete specification of the model of determinants of diversification, often accompanied by a misplaced emphasis on certain categories of determinants and/or the employing of inappropriate proxies for determinants.

Admittedly though, a majority of the ensuing errors could be attributed to the use of rather poor data base. Nonetheless, as a consequence of this, studies might not only have yielded inaccurate descriptions of levels of diversification, but may also have been raison d'etre for unsatisfactory results, both in terms of significance of determinants as well as overall explanatory powers of models of diversification. The following chapters will make an attempt to elucidate some of the pertinent problems, and, at the same time suggest means to mitigate or eliminate them. In a way, these may be considered as plus points of this thesis.

CHAPTER 3

THE DETERMINANTS OF DIVERSIFICATION: EMPHASIS OF THE PRESENT STUDY

3.1 INTERNAL FACTORS RECALLED

In the previous chapter we reviewed the various determinants of diversification which received attention in the literature. Broadly stated they can be classified as

(a) firm specific internal factors, and

(b) external influences.

A comprehensive review of the literature also indicated that the relative importance of these factors cannot as yet be stated unambiguously. The aggregate nature of the industry level studies may have been a source of the difficulties in measuring and assessing the significance of firm specific internal factors.[1]

It was already pointed out that Chaudhuri et al. (1982) is the most engaging study of diversification in our context. Even this study gave principal consideration to an external factor, various governmental regulations - such as, The Industries (Development and Regulation) Act 1951, Monopolies and Restrictive Trades Practices Act 1969, Foreign Exchange

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1. In this context, some studies explicitly admitted the difficulties involved. For instance, see Grant (1977, p. 90).

Regulation Act 1973, etc. as the major factor which motivated firms to diversify.[2] However, there have been well informed statements that firm specific factors are equally important if not more so.[3] The following statement by the chairman of the Tata Engineering and Locomotive Company is an example of this viewpoint. For, he stated, "the lead we have taken in commercial vehicles will help us acquire a similar position in the passenger car market which has been opened to us for the first time as a result of the timely liberalization of licensing policies for automobile manufacturers. ... We are certain, however, that with the commitment to quality, the large pool of trained manpower and the extensive

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2. By this we mean that the study does not seem to have systematically analyzed the importance of internal factors in inducing diversification, though it has taken a note of certain factors; such as, exploitation of an organization's strengths in various functional areas, actual and prospective growth of the existing markets, and risk reduction. However, it concludes that "the factors influencing diversification in large firms in India are somewhat different from the above." (p. 34).

3. The point is acknowledged both by economists and managers. By way of illustration, consider Lemelin's (1982, p. 656) view: "And we are aware that industry characteristics are probably not the principal determinants of diversification..... The next obvious step is to include industry characteristics together with firm-specific variables in a broader model to be tested with company data." A similar opinion is voiced in Grant (1977, p. 91). As he remarked "The poor explanatory power of the equations... is to be expected given the highly aggregated form of the data and the exclusion of the many variables likely to influence diversification. The excluded variables fall into two groups: the structural and managerial characteristics of individual firms, and industry variables which have a lesser, though possibly far from insignificant, impact on the attractiveness of diversification by firms."

manufacturing and service infrastructure TELCO has already built, the cars we field will come out on top."[4] The least that can be inferred from these contrasting viewpoints is that while governmental policies may have influenced the patterns of diversification, its extent seems to have been a result of the more pervasive internal factors relating to the firm.

Hence, the main emphasis of the present study is on the quantitative assessment of the extent of diversification at the firm level and on the internal forces which account for the observed diversity. A general theoretical specification can be attempted by extending the arguments of Penrose (1959) in regard to the growth of the firm.

3.2 THE PENROSIAN ANALYSIS AND EXTENSIONS

To Penrose, the firm is a pool of productive resources organized within a well-defined administrative framework. Its general purpose is to organize the use of its own resources, as well as those acquired from outside the firm, for the production and sale of goods and services which result in a profit for the owners.

The resources of the firm can be both human and physical in nature. However, productive resources are considered as a bundle of potential services rather than merely

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4. Taken from statement of the chairman, the TELCO for the year 1984-85. The times of India, July 10, 1985.

physical quantities. For, the same amount of physical resources may yield different quantities of potential services depending upon the organizational and managerial details. As a result the resource potential of firms tends to be specific and independent of the physical quantities as well as their market value at any point of time. The specificity and amount of potential services crucially depends on the experience which resources have in working together. As Penrose (1959, p. 23) observed "It is shown not only that the resources with which a particular firm is accustomed to working will shape the productive services its management is capable of rendering (where management is defined in its broadest sense), but also that the experience of management will affect the productive services that all its other resources are capable of rendering."

Clearly, there will be a particular amount of realisable productive services at a point of time, and by implication there will be a limit to the activities of the firm.

However, the resource potential of the firm has an internal dynamics of its own. As the firm (productive resources) acquires more experience in the production and marketing of the existing products, it will be possible to routinize many of the decisions. This process has the effect of reducing the number of decisions which managers need to attend to, as well as the amount of time which they need to spend on the decisions which require their attention. As a

result, unused managerial (productive) resources become available within the firm. These unused resources may then be employed for the expansion of the existing product lines and/or diversification.[5]

This does not mean that a firm has, of necessity, to wait for the emergence of resources. Of course, there always remains the possibility of acquiring resources from outside. However, due to the uniqueness of the firm's resources, outside resources have first to be trained so that they can become useful to the firm. The 'training costs' tend to be more in the case of diversification. For, not only the acquired resources have to be adapted, but even the existing resources have to familiarize themselves to tasks involved in new activities.[6]

Digressing for a while, we would do well to note that the 'specific asset' hypothesis of Gorecki (1975) is similar

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5. On the other hand, expansion and diversification projects would be restricted if managerial resources must be obtained from the market and adapted to the requirements of the firm.

6. Training costs can be of several types. Some of them are:

   (a) training of existing managers in new skills,

   (b) such miscellaneous duties as supervising the changes in routine necessitated by introduction of new products and/or production processes, and

   (c) using of existing managers to train new managers. Even if this training is not of a formal nature, it would still take time for new employees to familiarize with existing organizational structure.

to that of Penrose in its content when viewed from the general viewpoint of unused resources generated within a firm as a source of diversification. Whereas, Gorecki states that 'transfer costs' associated with the application of specific assets in new activities would be less for the transferor firm, the same idea has been conveyed by Penrose in terms of the training costs. As far as the question of transaction difficulties involved is concerned both analyses lead to the same conclusion. However, Gorecki has not specified the reasons for the emergence of specific assets at all. Both the hypotheses also share a common weakness in that they cannot specify the extent of the specific assets generated and the degree of underutilization at any point of time.

Reconsidering the emergence of unused productive resources, it should be noticed that the firm may be able to generate unused capacities, by a similar process, in other functional areas as well. In particular, advertising and marketing, research and development, as well as financing must be considered as important areas. However, at any time, the amount of unused productive resources is likely to differ from one function to another. These unutilized or under-utilized resources, depending upon their nature, can be employed by the firms for undertaking diversification or expansion ventures.[7]

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7. That is, depending upon the transferabilities of unused skills and knowledge to other product markets.

The details of the recognition of such unused resources and search of possible avenues for their employment is not important for our purpose.[8] In this context, we would like to mention that several institutional mechanisms may be suggested for this. The most commonly observed is the one where firms have specific resources allocated to monitor diversification possibilities.

The more important issue is the identification of the motives for the exploitation of the unused resources. In the Penrosian framework this has been attributed to the profit maximization over time. However, this need not be necessary or sufficient to ensure fuller utilization. A better alternative has been suggested by Marris (1964) who assigned this role to the capital market. That is, the threat of take overs posed by the capital market will act as a motivation for the managers- due to reasons like job security, etc. - to make a fuller utilization of resources. Thus, the preceding analysis is compatible even with the objective of managerial satisficing proposed by Williamson (1964).[9]

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8. An elaborate discussion of these issues can be found in Rubin (1970).

9. The mechanism which would lead to the exploitation of emergent resources is quite neatly brought out by Chamberlain (1968). He argues that in seeking promotions and recognition individual executives will be led to search for and advocate particular projects which enhance their own position. The creator of an idea has a strong interest in seeing that it is carried out, for this adds to his position in the firm.

In addition to the internal factors, diversification will also be influenced by external conditions confronting a firm. For, Penrose (1959, p. 151) maintains that "any change in circumstances that widens the productive opportunity of firms, or increases their managerial capacity for growth in relation to the growth in demand for their existing products will tend to increase diversification." Thus, characteristics of the base industry of the firm as well as those in which diversification is directed into, may also be relevant. Similarly, in a situation of the state assuming the role of interventionist power in the economic activity, public policy may also be expected to influence the corporate diversification to a significant extent.

On the basis of the preceding analysis we are in a position to formulate certain testable hypothesis concerning the determinants of diversification for the empirical study. These hypotheses relate to firm characteristics, the firm's primary industry characteristics, and public policies that are expected to affect corporate diversification in general. Unused and/or underutilized resources and knowledge will generally be used as a characterization of the firm specific determinants.

3.3 DETAILS OF EMPIRICAL SPECIFICATION

The following variables have been considered in the context of firm specific determinants of diversification.

(a) Managerial Excess Capacity

Unused and/or underutilized managerial resources have already been shown to be important in affecting diversification. We define managerial excess capacity as the ratio of expenditure incurred on managerial personnel to the sales of the firm. Thus,

$$MEC = \frac{\text{Expenditure on Managerial Personnel}}{\text{Net Sales}}$$

where, managerial personnel include all employees of the company who get remuneration exceeding Rs. 36,000 per annum and are employed throughout the year. We assume here that for every firm there exists a unique and optimal relationship between the amount of sales generated and expenditure on managerial resources.

Unused managerial capacity gives rise to diversification only after a time lag. Hence, an average of MEC over the past five years 1974-78 has been preferred as the empirical measure. Further, a positive relationship is postulated between the MEC and diversification.

(b) Advertising and Marketing

The marketing division of a firm may also experience underutilization with respect to its sales force and other intangible assets generated by advertising. Unused capacity in the marketing division of a firm, at times, may exist from the beginning. This will be the case in product markets

where it is essential to integrate distribution along with production. For, in such cases, a new firm will be forced to enter the market with its own distribution channels. Since there will be a minimum size of this division there is a possibility of excess capacity from the very beginning.[10] Expertise acquired by marketing personnel will also help in overcoming entry barriers to other product markets. Also, this division is most likely to come up with ideas for new products as they are in direct contact with the users and therefore are most likely to perceive changes in preferences and tastes of the existing customers.

However, the data relating to the marketing personnel is not reported separately in the annual reports or other published sources. But it is reasonable to assume that the MEC variable defined earlier captures this effect as well.

Following Gorecki (1975), advertising, on the other hand, may lead to the creation of a strong brand image and/or the company's name. That is, intangible assets may be generated by advertising. Such assets will mostly have spill-over effects on other product markets. Hence, these intangible assets will remain underutilized if the firm does not take advantage of them by diversifying.[11]

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10. The likelihood, however, will be more in case of firms entering on a nation-wide basis in contrast to those whose target is confined to regional markets.

11. An example of the extension of brand image can be seen in Ponds (India) Ltd. production 'of Dream flower' talc

contd...

However, there are limits on the extent to which such unutilized specific assets can be used to effect diversification. For, the transferability is generally expected to be confined to related and contiguous 4-digit product lines. Or, stated differently, the effect of this class of determinants is expected to decrease as the degree of product aggregation increases.

It is apparent from this analysis that the MEC variable alone cannot adequately reflect the underutilized specific assets in this category. Hence, the average of the advertising to sales ratio of the firm over the years 1974-78 was utilized to supplement the measurement. This ratio is expected to be directly related to the degree of diversification. However, limitations of data were severe in the use of this variable in all the cases examined in this study.

(c) Capacity Utilization Rate

Spare capacity can also be identified with plant and equipment of a firm, that is, installed production capacity. In this regard, however, one has to make a distinction between the excess capacity arising due to cyclical fluctuations in demand and the supply side bottlenecks, and long-run excess capacity. For, it is only the latter which can

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(11 contd...)

(code 3145) and 'Dream flower' soap (code 3141). Mcdowell and Co., on the other hand, utilized its name to move from liquors (code 222) to fast food retail outlets (code 659).

legitimately be viewed as an incentive for diversification at the firm level.

Persistent excess capacity may be a result of several factors. Firstly, it may occur due to lumpiness of capital outlays, which means that plant and equipment cannot be effectively purchased in successive small increments. Processing and some of the engineering industries offer examples of this. Secondly, it may stem from errors in anticipating growth in demand. Thirdly, sometimes, monopoly and oligopoly firms tend to overcapitalize so as to keep potential entrants at bay. However, as and when, entrants are able to capture a significant share of the market, it may result in excess capacity for the incumbent firms.

Whatever the reason for its occurrence, long-run excess capacity in production is an incentive for firms to make use of it by diversifying their operations. Obviously, the ability of a firm in using idle capacity in plant and equipment will depend upon its adaptibility to other uses. This adaptibility is likely to differ among industries. Thus, for example, it may be easy for a firm involved in producing fabricated goods to change its product-mix. Similarly, assembly-line based producers of goods, such as an automobile manufacturer, can utilize the existing facilities for the production of 4-wheelers, 3-wheelers or even 2-wheelers, at some additional costs.

Hence, spare capacity in plant and equipment is most likely to yield diversification within the 4-digit product lines belonging to a 2-digit industry.[12]

The capacity utilization rate has been taken as an indicator of the excess capacity in plant and equipment. This variable is a weighted average of capacity utilization rates in different products belonging to the firm's primary industry at the 4-digit level. Here capacity utilization rate is defined as the ratio of the actual production to installed capacity. The average capacity utilization rate in the primary industry for the years 1974 to 1978 has been used as the independent variable. Furthermore, we posit an inverse relationship between this variable and level of diversification.

(d) Firm Size

The extent of diversification is expected to be generally positively related to the size of the firm. For, there are several benefits to the firm, of its size. The following are worthy of mention in addition to those described in chapter 2. Firstly, a large size would imply that the firm will have a large pool of productive resources. Some of these will remain unused or underutilized since 'balancing of processes' may not be achieved. Secondly, a large firm has the resources to

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12. Diversification by Standard Motor Products of India Ltd. from passenger cars to light commercial vehicles, in wake of decline in demand for the former, can be considered as an example in this context.

usher in organizational changes which are vital for a proper functioning of diversified firms and its sustainability. Thirdly, the costs of acquisition and breaking-in of new resources within the firm can be expected to be smaller the larger the size of the firm.

The size of the firm can be represented by several variables. But, for the purposes of the present analysis, it is defined as the net sales of the firm in 1978.

(e) Economies of Scope

There are many cases, such as complementarity of one or more products in production, which are such that the cost of organizing several product lines together is less expensive compared to manufacturing each of them in a separate firm. Economies of scope are said to arise in such situations. Quite clearly, given the markets for various products, the existence of economies of scope may induce a firm to diversify. To the extent they are not exploited, they can be said to represent unused intangible assets of the firms. It should be noted that such economies may keep on emerging as a result of technological advances.

The greater the extent of processing of a raw material toward a final stage the more will be the value added per unit cost of the raw material. Similarly, if raw material can be saved due to production complementarity it is expected that the value added per unit of raw material usage increases.

We will adopt the value added to raw material used as a measure of the economies of scope.

For purposes of empirical estimation of this ratio, value added has been defined as the sum of salaries, wages, bonus, provident fund, gratuity; rent; and operating profit. The value of raw materials consumed consists of both indigenous and imported raw materials. The values used for them refer to the year 1978.

(f) Availability of Funds

The firm's ability to diversify is likely to be affected by the availability of finances. The availability of liquid funds facilitates and encourages diversification. Whenever the retained cash exceeds the total expansion and replacement needs of the firm, a firm would be faced with underutilized financial resources. For, generally the rate of returns available on liquid funds (from banks, bonds, and portfolio investments) is lower compared to what the firm can earn on productive operations. Hence, the prospects of a greater return will act as an incentive for diversification.

In addition, the availability of internally generated funds, a direct consequence of the profits earned in the past, also affects the firm's capacity in raising external funds and its costs. This assumes more importance in the case of firms belonging to 'large business houses' where certain minimum level of internal financing is prescribed by the government.

Hence, the more profitable the firm, the greater would be its ability to diversify. However, it would be worth noting that high profitability may not always result in a large pool of retained earnings. It is generally observed that there is a lot of variation in the dividend policies of the firms. Therefore, to the extent, a firm prefers profligacy with regard to dividends distribution, its retained earnings will be so much less.

Therefore, we have considered two variables as measures of the availability of funds. The first is the rate of the return on the total capital employed averaged over 1974-78. Shareholders' reserves and surplus is another proxy used in this context and is related to the year 1978.

Among the primary industry specific determinants of diversification, attention is focussed on the following.

(g) Growth Rate of the Primary Industry

It is generally expected that the rate of growth of the primary industry of the firm will be negatively related to its degree of diversification. For, the greater the growth rate of the firm's primary industry, the greater will be the scope for the firm to expand within that industry. Additionally, such expansions will also be easier and less costly for the firm as it will already possess the required expertise. Further, in as much as, industry profitability and its growth rate are positively related, expansion in the

existing product lines will be that much more profitable. This is the usual line of argument advanced in the literature for the use of the growth variable.

This need not always be valid. For instance, at times, the firm may be confronted by new product markets with so much more profit potential as to not only outweigh the profit rate and the growth rate in the existing product line but also compensate for the costs of entry. Under such circumstances, a firm may still diversify inspite of a high growth rate of its primary industry.

More significantly, as it happens to be in our context, there may be certain institutional impediments which restrain unrelenting expansion in existing product lines.

Owing to these considerations, the question of any relationship between the firm's primary industry growth rate and firm's diversity can best be decided on the basis of empirical results. In this study, primary industry growth rate has been represented by the proportionate increase in industry value of output between 1974 and 1978. Availability of data dictated the measurement of this variable at the 3-digit level only.

(h) Concentration in the Primary Industry

Concentration in the primary industry of the firm acts as an impediment to its uninhibited growth in that industry. For, an expansion of the firm in its primary industry, unless

the growth rate happens to be high enough, can only be at the expense of reductions in the market shares of other leading firms. They can be expected, in their turn, to react by price-cutting and/or some other market sheltering device, such as advertising. The net result would be an overall decline in the profitability of every firm in the market. Consequently, diversification might be the preferred strategy for both smaller and larger firms in such an industry.

Further, if the firm is a leading producer in a particular product line it is likely to face constraints on further expansion from the governmental policies as well. Specifically, if a firm happens to have 1/3rd of the share in a specific product market, then it would be subject to be classified as an MRTP company whereby expansion may not be allowed at all.

The measure of concentration used in this study is the familiar four-firm concentration ratio. These relate to 1978 and have been calculated at the product level only. This became imperative as no statistics were available on concentration ratios at different levels of industry classification. However, since the major product of a company mostly accounted for a substantial share in company's primary 4-digit industry, it is reasonable to assume that concentration ratios at the product level would be representative of concentration at the 4-digit level industry as well.

A positive relationship between diversification and concentration is posited. However, the relationship is likely to be more pronounced at the 4-digit level analysis because concentration ratios are defined at that level only. At the broader level of classification we expect the relationship to be considerably weakened since the same values of the ratios have been utilized.

Public policy, aimed at control and regulation of industries, constitutes an important element of the total external environment of the firm. Since diversification decisions are considered as a net result of both internal factors as well as external factors, it can be expected that a firm will frame its policies for diversification in consonance with the instruments of public policy it has to cope with.

Two categories of public policy instruments, which may have an effect on diversification, can be identified in our country. They are:

(a) Fiscal incentives for investments, and

(b) Regulatory legislations.

Among the several fiscal incentives available to firms, the tax incentives are more relevant from the point of view of diversification. This is so because tax savings can only be availed of by fast growing and profitable companies. However, since there exist certain regulatory constraints on the continuous growth in existing product lines, savings can

only be realised by undertaking investments in diversified channels. But this will depend on the relative strengths of the realisable amount of savings and the extra costs that will normally have to be incurred in diversified expansion.

Out of the instruments of regulatory legislation, following can be considered to be more important: (i) Industries (Development and Regulation) Act, 1951 and the (ii) Monopolies and Restrictive Trade Practices, Act, 1969. The chief purpose of IDRA is to direct investible resources into predetermined channels of production. Under its provisions, any company contemplating an investment of more than Rs. 3 crores in plant and machinery has to seek prior approval of the government in the form of an industrial license. The MRTP Act is expected to ensure that the 'operation of economic system does not result in the concentration of economic power to the common detriment'. Companies under the purview of this Act are required to take permission from the government before effecting any substantial expansion, establishing a new undertaking or attempting a merger or amalgamation with any other undertaking. The Act is applicable to two types of companies:

(a) Those which on their own or along with their inter-connected undertakings hold at least one-third share in their line of production and at the same time control assets of not less than Rs. 1 crore.

(b) Those which on their own or along with their inter-connected undertakings control assets of not less than Rs. 20 crores.

Also, the MRTP companies will normally be permitted to expand their activities further only in some selected capital and technology intensive sectors (Industrial Policy, 1978).

These regulations can be seen as an impediment to expansion and to some extent, diversification as well. However, both have been controversial as far as their practical relevance and operational efficacy are concerned. Thus, it is difficult to conjecture the exact nature of relationship between diversification and regulations.

With a view to ascertain this empirically, we have sought to capture the effect of regulations by making use of a dummy variable which takes value 1 if the company is registered under the MRTP Act and 0 otherwise. It has been assumed here that MRTP companies have, in general, had to cope with various legislations. In any case, the other important Act, that is IDR, is implicit in the MRTP Act as non-MRTP companies get a preference over the MRTP companies for purposes of licensing under the IDR Act (Indian Investment Centre, 1982). Thus, a significant coefficient on the dummy variable would largely be indicative of the fact that diversification patterns of regulated companies are, in fact affected by the public policy.

Various determinants of diversification analysed and specified in the preceding will be utilized in formulating regression equations for the purpose of empirical verification. While this is attempted in chapter 6, our next immediate task is to describe the sample selected for this study. This becomes the subject of the next chapter.

CHAPTER 4

THE NATURE OF THE SAMPLE UNDER STUDY

4.1 INTRODUCTION

The earlier discussion on the determinants of diversification, and the emphasis therein on the role of the internal resources of the firm in acting as a stimulus to the firm's diversification decisions, indicates that such an analysis would be more pertinent to the organization of firms which have a separation of ownership from control. Clearly, these firms can grow to a much greater extent primarily because the nexus between the financial position of the firm and owners is considerably weakened. Similarly, since the management of the firm is divorced from the ownership, this enables the managers to take larger risks. Secondly, this type of firm, because of its greater managerial resources, is in a much better position to pay attention to strategy formulation by creating a separate layer of management exclusively for this purpose. Lastly, the assumption of long-run profit maximization and growth, which was implicit in developing the hypotheses of the determinants of diversification, would be found to be most plausible for the above type of firm. Generally, the above characteristics are presumed to be possessed by a joint-stock company form of organization. Therefore, the sample companies chosen for this study are from amongst public limited joint-stock companies in the private manufacturing sector.

The sample selection of the companies was made with diversification as a criterion.[1] For this, a company was deemed to be diversified if it manufactured two or more products classifiable into distinct NIC industry codes at the 4-digit level of classification. Subsidiaries of a company, however, were not taken into account for this purpose.[2] To begin with, a preliminary list of diversified companies, that were predominantly engaged in manufacturing activities and had net sales of Rs. 3 crores or more in 1978, was prepared on the basis of the information on the financial and production data given in the Stock Exchange Official Directory. Amongst these, only those companies were included in the sample for which requisite data was available for the period 1974-79.[3]

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1. In addition, it was ensured that a company included in the sample did not use merger or acquisition as a major strategy in the recent past.

2. Inspite of the fact that a subsidiary has major financial and managerial links with the parent firm and that it is sometimes promoted as a convenient ploy to circumvent regulatory policies, we do not take the subsidiaries into account due to lack of data. Also, we feel that though it may be interesting in its own right, it involves a separate issue of the relative economics of adding a product to the company's existing portfolio and floating of a subsidiary for the same purpose. Instead, our data can be interpreted as reflecting the hard core of the diversification, that is, diversification that is integral to the firm's activities.

3. Thus, some companies had to be deleted either due to non-availability of annual reports or becauseof insufficient data. Also, a few companies were dropped as they turned out to be predominantly trading concerns.

4.2 THE NATURE OF SAMPLE COMPANIES

The sample consists of 140 diversified public limited companies in the private manufacturing sector. A list of these companies is given in Appendix 4.A. The sample companies (hereinafter SCo) had a paid-up capital of Rs. 674.8 crores in 1978. Table 4.1 shows the number and paid-up capital of the SCo and different categories of non-government companies. Thus, in 1978, the SCo, 0.3 percent in number, accounted for 19.3 per cent of the total paid-up capital of all non-government companies. The corresponding percentages for all public limited companies were 1.8 and 25.5 in the same year. The SCo also registered a much greater increase in their paid-up capital between 1974-79. For instance, although the SCo proportion, in terms of number, came down from 2.0 per cent to 1.8 per cent, their paid-up capital at the same time increased from 22.7 per cent to 27.2 per cent of all public limited companies. Similarly, the SCo experienced a growth of 37.8 per cent in paid-up capital in absolute terms between 1974-79. The percentage figures of increase for all non-government, private limited, and public limited companies were 19.3, 32.0, and 18.7 respectively. It is worth noting here that these comparisons are somewhat biased downwards.[4]

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4. This is so because the SCo belong to the manufacturing sector alone, whereas figures for all non-government, public limited, and private limited companies include companies engaged in all types of economic activity. Therefore, unless the figures relating to other group of companies refer to the manufacturing sector alone, the share of the SCo in terms of paid-up capital will be understated.

TABLE 4.1

Number and Paid-up Capital of Registered Non-Government and Sample Companies

	No. of Companies				Paid-up Capital (Rs. Crores			
	1974	1978	1979	Per cent Change 1979-74	1974	1978	1979	Percent Change 1979-74
1. All Registered Non-Government Companies[a]	37035	47210	50269	35.7	2985.9	3496.7	3562.9	19.3
2. Private Limited[a]	29964	39485	42376	41.4	662.6	847.3	874.9	32.0
3. Public Limited[a]	7071	7725	7893	11.6	2323.3	2649.4	2688.0	15.7
4. Sample Companies	140	140	140	0.0	528.3	674.8	727.9	37.8
5. 4 as a percentage of 1	0.38	0.30	0.28		17.7	19.3	20.0	
6. 4 as a percentage of 3	2.0	1.8	1.8		22.7	25.5	27.2	

a - Source: Company News and Notes, Vol. XX, Jan. 1982, p. 3.

Table 4.2 suggests that the SCo are much larger in size in comparison with other groups of companies, on the average. For example, in 1978, the average paid-up capital of a sample company was Rs.4.82 crores. In contrast, the corresponding figures for companies in the non-government and public limited categories- excluding the SCo - were Rs.0.06 crores and Rs. 0.26 crores. Thus, a diversified sample company, on the average, was about 19 times as large as an average public limited company.[5]

Between 1974 and 1979, the average size of the SCo went up from Rs. 3.77 crores to Rs.5.20 crores. While all registered non-government companies and all public limited companies witnessed a decline of 14.3 per cent and 3.84 per cent respectively in their average sizes. Thus, the average size of a sample company which was about 14 times that of the remaining companies (public limited) in 1974, became 21-fold in 1979. It can be seen, therefore, that diversified companies, on the average, have not only been bigger but they

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5. Strictly speaking, information in Table 4.2 cannot be used for making accurate comparisons between relative size of a diversified and non-diversified company. For, the total number of diversified companies and their paid-up capital in a given category of companies is not known. Therefore to the extent there are smaller diversified companies, other than the SCo, the average size of a diversified company will be reduced. On the other hand, the average size of a non-diversified company is likely to go up. However, proceeding on the assumption that diversified companies other than the SCo, on an average are not smaller than non-diversified companies and that they are few in number, Table 4.2 can at least be used for making approximate comparisons between relative sizes and changes in the same.

TABLE 4.2

Comparison of Average Size* of Different Groups of Companies

	Average Size (Rs. Crores)			
	1974	1978	1979	Per cent Change 1979-74
1. All Registered Non-Government Companies (excluding the SCo)	0.07	0.06	0.06	- 14.3
2. Public Limited Companies (excluding the SCo)	0.26	0.26	0.25	- 3.8
3. Sample Companies	3.77	4.82	5.20	37.9

* Size has been measured in terms of paid-up capital and is in Rs. crores.

have tended to become still bigger during 1974-79.[6]

The size distribution of the sample companies, when size is measured in terms of net sales, in Table 4.3 shows that the distribution is more or less uniform excepting classes Rs. 11.0 to Rs. 20.0 crores and above Rs. 200 crores. This roughly suggests that the diversification was not a more preferred strategy of any particular sized sample companies.

The SCo have been further sub-divided into various industry groups. These groupings were made in order to elicit information on the differences in the magnitude of industry-wise diversification levels and also to bring out the variations in the explanatory power of different determinants of diversification across industries.[7] The SCo encompassed a wide range

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6. There is some supportive evidence on the relative bigness of the diversified companies. In the Industrial Credit and Investment Corporation of India study "Financial Performance of Companies, ICICI Portfolio: 1978-79', a diversified public limited company is seen to be about 3 times that of a non-diversified one. This rather large discrepancy between our finding and the ICICI with regard to the relative sizes can be imputed to the following;

   (a) The ICICI study has a coverage of 417 companies only,

   (b) The definition of diversification adopted in the ICICI study is much narrower and excludes many companies which were diversified according to our criterion.

7. It was, however, not feasible to group companies by the ownership and thus, conduct the analysis at the 'business-house' level. In this context a business-house is taken to mean a group of companies owned and controlled by an individual(s) - such as, Tatas, Birlas, and Singhanias. For, very little information exists on the independence of the firms, their inter-relationships, or the nature of the top controlling authority with respect to a particular business-house. In any case, such an exercise can never be comprehensive since almost every business-house owns certain privately-held companies, the requisite data for which is not available at all in a published form.

TABLE 4.3

Size Distribution of the Sample Companies, 1978

Class Interval (Net Sales)	No. of Companies	Percentage
Below Rs. 10 crores	15	10.7
- 20 "	38	27.1
- 30 "	14	10.0
- 40 "	19	13.6
- 60 "	24	17.1
- 100 "	11	7.9
- 200 "	15	10.7
Above Rs.200 "	4	2.9

of activities in the manufacturing. Thus, out of 19 industry codes at the 2-digit level, the SCo had 15 as their primary industry at the same level of classification. Our preliminary investigations indicated that there were very few diversified companies in certain sectors, viz., code 27 (Manufacture of Wood and Wood Products, Furniture and Fixtures), code 29 (Manufacture of Leather and Leather and Fur Products), code 30 (Manufacture of Rubber, Plastic, Petroleum and Coal Products), code 33 (Basic Metal and Alloy Industries), and to some extent, code 34 (Manufacture of Metal Products and Parts, except Machinery and Transport Equipment).[8] Further, a considerable variation was observed with respect to the number of diversified companies in different industry groups. Also, a relatively larger number of companies, that were diversified, appeared to have their primary industries as a stagnant one or a relatively fast growing one.

Table 4.4 depicts the ownership composition of the SCo. In the table, companies owned by large houses account for about

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8. Fewness of diversified companies in these industry groups could be due to:

   (a) Minimum optimal scale of production in some of these industries, notably code 27 and 29 would generally be small. Consequently, companies in these sectors tended to be smaller in size. To the extent diversification is correlated with the size of the company, one would expect a lesser number of diversified companies in the above industry groups.

   (b) As far as codes 30 and 33 are concerned, a majority of companies happen to be government owned. According to one study, government companies, in general, have a lesser opportunity to diversify primarily due to certain institutional arrangements.

TABLE 4.4

Ownership Composition of the Sample Companies, 1978

Industry	No. of Companies (1)	Large House (2)	Large House Foreign* (3)	Private Indian (4)	Private Foreign* (5)	MRTP Companies (6)	(6) as Percentage of (1)
Automobiles	10	5	1	4		6	60.0
General Engineering	15	6	1	8		9	60.0
Chemicals	26	4	3	10	9	9	34.6
Cotton Spinning	6			6			
Synthetic Fibre	10	5		5		6	60.0
Textiles	23	14	1	8		16	69.6
Sugar	13	5		8		6	46.2
Food Products	12	2		7	3	2	16.7
Cement	8	4		4		1	12.5
Jute Textiles	7	4		3		4	57.1
Paper	3	3				3	100.0
Miscellaneous	7	3	1		3	7	100.0
Total	140	55	7	63	15	69	49.3

44 per cent of the SCo. Although we do not elaborate upon it here, the information contained in Tables 4.1 and 4.5 can be used to show that companies owned by large houses are proportionately more diversified (in terms of number) than the remaining companies. It is worth noting here that nearly 50 per cent of the sample companies are MRTP companies.[9]

4.3 REPRESENTATIVENESS OF THE SAMPLE

In the absence of official statistics or some other published source on the number of diversified companies and related data it is not possible to determine the exact magnitude of the sample coverage of the present study. However, a few general observations can be made on the sample coverage. Table 4.5 gives the details of the sample coverage of the diversified public limited companies in the manufacturing sector. These companies have been chosen from amongst 1300 large companies[10] by utilizing the ICICI definition of diversification.[11] On that basis there were 45 diversified public limited companies in 1978, with a paid-up capital of

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9. That is, companies which are registered under the Monopolies and Restrictive Trade Practices Act, 1969.

10. These are given in "Basic Data Relating to 1300 Larger Business Units", Centre for Monitoring Indian Economy, April 1981 . It covers companies both in the public and the private sector.

11. In the ICICI study a company is considered to be diversified if no single industrial activity accounts for at least 75 per cent of the total turnover of the company (p. 228). The delineation of industries for this purpose appears to approximate somewhere between 2-, and 3-digit level of classification, though it is not mentioned explicitly.

TABLE 4.5

Sample Coverage of the Diversified Companies[a] Among the 1300 Large Companies*, 1978

	Diversified Companies Among the 1300 large Companies (1)	Share of the Sample Companies in (1) (2)	Coverage (%) (3)
No. of Companies	45	34	75.6
Paid-up Capital (Rs.Crores)	207.2	177.8	85.8
Sales (Rs. crores)	2554.5	2188.8	85.7

a - According to the definition of diversification as used in ICICI study.

* - Source : Economic Intelligence Service, "Basic Data Relating to 1300 Large Business Units", Centre for Monitoring Indian Economy, April 1981.

Rs. 207.2 crores and sales of Rs. 2554.5 crores. Out of these, the sample includes 34 companies, with a paid-up capital of Rs. 177.8 crores and sales of Rs. 2188.8 crores. Thus, the sample coverage in terms of number is 75.6 per cent. The corresponding percentages with respect to paid-up capital and sales are 85.8 and 85.7 respectively. Table 4.6 provides information on the sample coverage of diversified companies amongst 1300 large companies when diversification is defined in the way used in this study. That is, diversification is calculated at the 4-digit level of industry classification and is defined irrespective of the proportion of the primary industry output in the total output. Here again, we find the sample coverage to be quite high.[12] The sample accounted for 69.7 per cent of the total with respect to the number of diversified companies. Similarly, in relation to paid-up capital and sales, the sample coverage is 85.6 per cent and 86.3 per cent respectively. Divergence between sample coverage percentages with regard to number and paid-up capital as well as sales indicates that the sample companies are somewhat larger than the remaining diversified companies.

In sum, the sample selected for the study can be said to be sufficiently representative of large diversified

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12. This should be interpreted with circumspection. For, the number of diversified companies was arrived at by scanning through the major products of companies only as reported in the CMIE publication. Consequently, many of the diversified companies may have been left out.

TABLE 4.6

Sample Coverage of the Diversified Companies[a] Among the 1300 Large Companies*, 1978.

	Diversified Companies Among the 1300 large Companies (1)	Share of the Sample Companies in (1) (2)	Coverage (%) (3)
No. of Companies	201	140	69.7
Paid-Up Capital (Rs. crores)	788.4	674.8	85.6
Net Sales (Rs. crores)	7879.7	6800.0	86.3

a - By using diversification criterion used in this study.

* - Source: Economic Intelligence Service, "Basic Data Relating to 1300 Large Business Units", Centre for Monitoring Indian Economy, April, 1981.

companies in the private manufacturing sector. Thus, enough confidence can be placed on the findings of this study.

The next chapter is devoted to the measurement aspects of diversification and presentation of the extent of diversification exhibited by the sample companies.

APPENDIX 4.A

INDUSTRY-WISE LIST OF THE SAMPLE COMPANIES

A - Automobiles Industry

1. Escorts Ltd.
2. Mahindra and Mahindra Ltd.
3. Automobile Products of India Ltd.
* 4. Tata Engineering and Locomotive Co. Ltd.
5. Ashok Leyland Ltd.
6. Enfield India Ltd.
7. Premier Automobiles Ltd.
8. Hindustan Motors Ltd.
9. Bajaj Tempo Ltd.
10. Standard Motor Products of India Ltd.

B - General Engineering Industry

1. SLM - Maneklal Industries Ltd.
2. Central India Machinery Mfg. Co. Ltd.
3. Kirloskar Oil Engines Ltd.
4. Guest, Keen, Williams Ltd.
5. Shivaji Works Ltd.
6. Kamani Engineering Corporation Ltd.
7. Jay Engineering Works Ltd.
8. New Standard Engineering Ltd.
9. Kirloskar Brothers Ltd.
10. Beco Engineering Co. Ltd.
11. Machinery Manufacturers Corporation Ltd.
12. Texmaco Ltd.

13. Triveni Engineering Works Ltd.

* 14. Kirloskar and Crompton Engineering Ltd.

15. VOLTAS Ltd.

C - Chemicals Industry

1. Hindustan Lever Ltd.

2. Alkali and Chemical Corporation of India Ltd.

3. Indian Explosives Ltd.

4. IDL Chemicals Ltd.

5. Dharamsi Morarji Chemical Co. Ltd.

6. Ion Exchange (India) Ltd.

7. Union Carbide India Ltd.

* 8. Calcutta Chemical Co. Ltd.

9. Excel Industries Ltd.

10. Dhrangadhra Chemicals Works Ltd.

11. Chemicals and Plastics India Ltd.

12. BASF India Ltd.

13. Indian Oxygen Ltd.

14. Hindustan Gas and Industries Ltd.

15. Indian Dyestuff Industries Ltd.

16. Mettur Chemical and Industrial Corporation Ltd.

17. Cellulose Products of India Ltd.

18. Nuchem Plastics Ltd.

19. Anil Starch Products Ltd.

20. Atul Products Ltd.

21. Bayer (India) Ltd.

* 22. Sandoz (India) Ltd.

23. Reckitt and Coleman of India Ltd.

24. Warner Hindustan Ltd.

25. Glaxo Laboratories (India) Ltd.

26. Unichem Laboratories Ltd.

D - Cement Industry

1. Orrissa Cement Ltd.

2. Panyam Cements and Mineral Industries Ltd.

3. Dalmia Cement (Bharat) Ltd.

4. Associated Cement Companies Ltd.

5. Jaipur Udyog Ltd.

6. Saurashtra Cement and Chemical Industries Ltd.

7. India Cements Ltd.

8. Shree Digvijay Cement Co. Ltd.

E - Cotton Spinning Industry

1. Premier Mills (CBE) Ltd.

2. Dawn Mills Co. Ltd.

3. Gokak Patel Volkart Ltd.

4. Rajasthan Spg. and Wvg. Mills Ltd.

5. Vardhaman Spinning and General Mills Ltd.

6. Aditya Mills Ltd.

F - Jute Textiles Industry

1. Fort Gloster Industries Ltd.

2. Fort William Co. Ltd.

3. Hastings Mills Ltd.

4. General Industrial Society Ltd.

5. New Central Jute Mills Ltd.

6. Hukumchand Jute Mills Ltd.

7. Birla Jute Mfg. Co. Ltd.

G - Paper Industry

1. Ballarpur Industries Ltd.

2. Straw Products Ltd.

3. Rohtas Industries Ltd.

H - Food Products Industry

* 1. Malwa Vanaspati and Chemical Co. Ltd.

2. IVP Ltd.

3. Food Specialities Ltd.

4. Britannia Industries Ltd.

5. Kusum Products Ltd.

6. Amrit Vanaspati Co. Ltd.

7. Laxmi Starch Ltd.

8. Tungbhadra Industries Ltd.

* 9. HMM Ltd.

* 10. Kota Oil Mills Co. Ltd.

* 11. WIPRO Products Ltd.

* 12. Rasoi Vanaspati and Industries Ltd.

I - Sugar Industry

* 1. Oudh Sugar Mills Ltd.

* 2. Upper Doab Sugar Mills Ltd.

3. Nizam Sugar Factory Ltd.

4. Hindustan Sugar Mills Ltd.

5. India Sugars and Refineries Ltd.

6. Sakthi Sugars Ltd.

7. Kesar Sugar Works Ltd.

8. Andhra Sugars Ltd.

9. Maharashtra Sugar Mills Ltd.

10. Cawnpore Sugar Works Ltd.

11. K.C.P. Ltd.

12. Saraswati Industrial Syndicate Ltd.

13. Modi Industries Ltd.

J - Textiles Industry

1. Rohit Mills Ltd.

2. Madura Coats Ltd.

3. Century Spg. and Mfg. Co. Ltd.

4. Binny Ltd.

5. Ahmedabad Advance Mills Ltd.

6. Morarjee Gokuldas Spg. and Wvg. Co. Ltd.

7. Standard Mills Co. Ltd.

8. Mafatlal Fine Spg. and Mfg. Co. Ltd.

* 9. Juggilal Kamlapat Cotton Spg. and Wvg. Mills Co. Ltd.

10. Bharat Vijay Mills Ltd.

11. Modern Mills Ltd.

12. Raja Bahadur Motilal Poona Mills Ltd.

13. Birla Cotton Spg. and Wvg. Mills Ltd.

14. Sayaji Mills Ltd.

15. Shree Ram Mills Ltd.

16. Mafatlal Industries Ltd.

17. Ahmedabad Mfg. and Calico Printing Co. Ltd.

18. Kothari (Madras) Ltd.

19. Delhi Cloth and General Mills Co. Ltd.

20. Shri Ambica Mills Ltd.

21. Kesoram Industries and Cotton Mills Ltd.

22. Modi Spg. and Wvg. Mills Co. Ltd.

23. Jiyajee Rao Cotton Mills Ltd.

K - Synthetic Fibres

1. South India Viscose Ltd.

2. Baroda Rayon Corporation Ltd.

3. Indian Organic Chemicals Ltd.

4. National Rayon Corporation Ltd.

5. Gwalior Rayon and Silk Mfg. Co. Ltd.

6. Sirsilk Ltd.

7. Indian Rayon Corporation Ltd.

* 8. J.K. Synthetics Ltd.

9. Bharat Commerce and Industries Ltd.

10. Reliance Textiles Industries Ltd.

L - Miscellaneous

1. I.T.C. Ltd.

* 2. Duncans Agro Industries Ltd.

3. Jayshree Tea and Industries Ltd.

4. WIMCO Ltd.

5. Hindustan Ferodo Ltd.

6. Shaw Wallace and Co. Ltd.

7. Ballis India Ltd.

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* For these companies, the diversification indices could not be computed for the years 1974 and 1979 due to lack of data.

CHAPTER 5

MEASUREMENT OF DIVERSIFICATION

5.1 METHODOLOGY

The accuracy of a diversification study will crucially depend upon the method followed in measuring diversification. Any method chosen for this purpose has to take the following aspects into consideration:

(a) selection of an appropriate index for computing output diversity,

(b) the scheme for delineation of the firm's output into distinct categories,

(c) the specification of the nature and type of data to be utilized as a base for the calculation of the index, and

(d) the way in which the shares of distinct products, in the firm's total output are arrived at, on the basis of (b).

These issues will be discussed sequentially in the rest of this section.

With regard to the choice of the index for measuring diversification, we already noted that Industry Count, Secondary Specialization Ratio, and Gort index were somewhat inferior in comparison with the other composite indices of diversification. For, the former group of indices are prone to give rise to either an overstatement or an understatement of the actual level of diversification since they

do not consider the relative size distribution of the products of the firm. However, if there is no skewness in the relative shares of products in the total output, no single index, among the quantitative measures, can be shown to possess overwhelming advantages over others on a conceptual basis. Since the skewness cannot be ascertained beforehand, the question of appropriateness of indices can only be judged on the basis of empirical results. But the empirical evidence in this regard has so far been inconclusive.

Caves (1977b, p. 125) found that "no major conclusion is affected by one's choice of a diversity index, although marginal shifts do occur in the levels of significance." Goreaki (1978, p.67), on the other hand, seems to disagree with it. Likewise, Honeycutt and Zimmerman (1976, p. 516) observed that "the sign and statistical significance of the coefficients (of the variables) are also differentially influenced by (the choice of) alternative index(es)."

Thus, in order to arrive at a reasonable resolution of this issue in our context, we will make use of the following nine indices in the subsequent empirical analysis. The indices are: (i) Industry Count (DI), (ii) Secondary Specialization Ratio (DS), (iii) Gort Index (DG), (iv) Berry Index (DB), (v) Numbers-Equivalent (Berry)(NE(DB)), (vi) Utton Index (DU), (vii) Entropy Index (DE), (viii) Numbers-Equivalent (Entropy) (NE(DE)), and (ix) Gravity Index (DT). These indices are defined in Appendix 5.A and are such that an

increase in their values represents an increase in diversification. It would be worth pointing out that one of the unique characteristics of this study is its extensive treatment of different indices of diversification; especially, the use of the Numbers-Equivalent corresponding to Berry and entropy index which have not been tried in the empirical work so far.

Another issue in this context is an explicit identification of an appropriate classification system for delineating the firm's output since the level of diversification will be affected by the broadness or narrowness of industry categories. In economic theory, a market has traditionally been defined as a set of products for which the cross-elasticities of demand as well as supply exceed some critical levels. Given the range of cross-elasticities, a market will consist ofa certain number of products. There are, however, both conceptual and practical difficulties in the application of this criterion. Similarly, if one were to classify products from the firm's point of view, it is once again fraught with many difficulties. Especially, it would not be possible to lay down any standards for the classification system since diversification defined for the economy at large is unlikely to be descriptive of diversification as perceived by any firm.

Due to these considerations the standard classification schema has been adopted. Specifically, this study makes

use of the National Industrial Classification, 1970 for the identification of distinct products. The NIC contains the major features and revisions of International Standard Industrial Classification, 1968, with few changes. The NIC, like other SIC schemes is a numerical system in which industries have been classified at the varying levels of fineness, namely 1-digit, 2-digit, 3-digit, and 4-digit code numbers. In the NIC, economic activities are grouped together in terms of similarities in the process used, raw material used, and nature of finished goods. Thus, the primary emphasis in defining industries is placed on the supply side factors.[1]

The NIC has 12 major groups (1-digit), 68 sub-groups (2-digit), 391 industries (3-digit), and 733 sub-industries (4-digit). With respect to manufacturing activities, the number of industries at the corresponding levels of classification are 2, 19, 170, and 614 respectively.

The use of the NIC presents a problem regarding the level at which diversification should be measured. Since the appropriate level of industry classification cannot be a priori ascertained, we measured diversification at the 2-, 3-, and 4-

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1. The usual criticisms of the SIC schemes also apply to the NIC. But no improvements were possible in this regard. Besides, Montgomery (1982) has shown that there exists a high degree of correspondence between the quantitative measures and categorical measures. Therefore, the ordinal nature of the NIC poses fewer problems than what have been generally expected.

digit levels of the NIC. This is likely to have two advantages: Firstly, it will enable us to qualitatively characterize the patterns of diversification; that is, whether diversification has been into related product markets (4-digit industries within the same 2-digit industry) or it has taken place into widely different activities (inter 2-digit). Secondly, it also presents an opportunity to test the sensitivity of the empirical results to the levels at which diversification is defined. Thus, we might be in a position to decide the relative suitability of the level at which diversification should be defined.

A further consideration involves the choice of data used to calculate product proportions and subsequently, indices of diversification. Previous studies employed different types of data - including employment, payrolls, assets, net output, and sales - for this purpose. Measuring diversification in terms of payrolls or employment has the limitation that the character of technology will influence the relative magnitude of the proportions attributable to different products in the total output of the firm. Thus, if a firm diversifies into the industry which uses a highly labour saving technology, the measurement in terms of employment or payrolls will underestimate the relative importance of that industry to the firm. The use of payrolls, assets, and employment also involves the problem of allocating non-specific inputs among different products. Further,

payroll may differ from industry to industry depending upon productivity and other factors. The use of sales, as in this study, for the purpose of measurement of diversification does not suffer from the above stated limitations. Additionally, the use of product-wise sales data also enabled us to exclude vertical integration. It should be noted that no study of diversification has so far omitted vertical relationships although most were aware of the problem. How this was done needs some explanation.

For the purpose of calculation of relative shares of products in the company's total output, a profile of sales by distinctly classified products was made for each company. The necessary data for developing these profiles was taken from annual reports of companies. In cases where a company's total sales were spread over different plants or units, the product-wise sales profile for the company was arrived at by adding the actual product-wise sales for each individual plant or unit.[2] In both instances, however, certain products which happened to be consumed internally, implying that such products pertained to intermediate steps in the production

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2. Earlier studies, because of inadequate data, made different assumptions about how the plant's output is distributed over the industries in which it operates. The arbitrary nature of such assumptions has had the effect of not only creating a bias in the measurement of diversification but vitiating the empirical results as well. The use of actual product-wise sales of the firm eliminates this problem. For details, refer to Gorecki (1980 b).

of some final good, were not included in the product profile of the company. Thus, following the above procedure, vertical relationships have been eliminated to a large extent in this study.[3] Finally, product-wise sales profiles thus developed have been utilized in the computation of the above mentioned indices of diversification for the sample companies for the years 1974 to 1979. Appendix 5.B details guidelines adopted in the classification of products into industry codes.

5.2 EXTENT OF DIVERSIFICATION

In this section, we present the extent and other features of diversification observed for the sample companies in 1978. Table 5.1 shows the average values of diversification indices for the sample companies at 4-, 3-, and 2-digit level of industry classification.

On an average the sample companies in 1978 were active in 5.8, 4.8, and 3.4 separate industries at 4-, 3-, and 2-digit level respectively.[4] This, however, is considerably less than

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3. Forward vertical integration into distributive activities, however, could not be removed by following this procedure. In fact, it is not possible to do so if one makes use of the sales data in the calculation of the indices.

4. Notice a close similarity between the 1978 value (5.8) of Industry Count Index at the 4-digit level and the 1975 value (5.8) of the diversity score in Choudhury et al. (1982). This resemblence can be regarded as a further support to Montgomery's (1982) finding that there exists a high degree of correlation between quantitative measures and the measures based on the qualitative approach.

TABLE 5.1

Average 4-, 3-, and 2-Digit Diversification, 140 Companies, 1978

Index	4-Digit			3-Digit			2-Digit		
	Average	S.D.	C.V.	Average	S.D.	C.V.	Average	S.D.	C.V.
DI	5.807	3.132	53.94	4.792	2.364	49.34	3.421	1.429	41.78
DS	0.361	0.205	56.90	0.315	0.205	65.10	0.237	0.198	83.82
DG	2.453	2.290	93.35	1.784	1.731	97.02	0.980	1.041	106.25
DB	0.475	0.220	46.36	0.418	0.228	54.67	0.318	0.229	72.23
NE (DB)	2.324	1.126	48.44	2.059	0.971	47.16	1.681	0.681	40.50
DU	2.323	1.122	48.32	2.028	0.935	46.13	1.643	0.642	39.08
DE	0.926	0.483	52.12	0.784	0.462	59.01	0.563	0.404	71.78
NE (DE)	2.849	1.487	52.22	2.449	1.245	50.85	1.913	0.834	43.63
DT	1.217	0.635	52.22	0.740	0.434	58.73	0.320	0.232	72.77

the theoretically possible number of industries into which the SCo may have diversified. For example, the NIC has 614 industry codes (manufacturing alone) at the 4-digit level, which means that the SCo on an average had their products in only 0.9 per cent of the possible number of industries. Such proportions, however, seem to move up with the increasing broadness of the classification. At the 2-digit level, the ratio is 18 per cent. This can be construed to mean that the SCo have preferred to diversify more into unrelated industries. In other words, the ratio between the 4-digit and the 2-digit number of industries being about 32, the corresponding ratio for the SCo should be expected to be closer to the former. But it is 1.7 only. This implies that the SCo have not utilized the full scope of their primary 2-digit industries.

This point can be more clearly brought out by making use of the measured values of entropy index at different levels of industry classification. Since 2-digit entropy represents diversification into broader aggregates, the ratio between its value at the aggregated level to that at the finer level of classification gives a better picture of the relative importance of unrelated diversification compared to the overall diversification at the finer level. Accordingly, the ratio between average values of DE2 and DE4 is found to be 60.8 per cent. This implies that a greater than half of the sample companies' diversification was of the conglomerate or

unrelated variety.[5] A closer examination of the 2-digit industry codes in which these companies were active, however, revealed that those codes are mostly placed contiguously in the NIC. As it is, in some instances adjacent 2-digit codes do not happen to be ones in which the nature of technology can be regarded as widely different. Therefore, to that extent, the actual degree of the conglomerate diversification will be lower than what has been observed here.

A greater preference for the conglomerate activities shown by the sample companies can be attributed to

(a) higher profits in chosen product lines,

(b) relatively easier access to foreign technology,

(c) lack of competition in such industries (mainly due to high volumes of investments needed to effect entry),

(d) certain institutional factors, such as allowing of a higher debt-equity ratio in some industries, and

(e) development of internal resources which could be applied in the manufacture of unrelated products.

The pattern of diversification aside, secondary activities do appear to be of considerable significance in the product profiles of firms. Thus, about 36 per cent of the total sales

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5. This finding is in consonance with Chaudhuri et al. (1982), who reported that private sector firms diversified mostly into areas unrelated to their existing businesses.

of these companies can be attributed to their secondary products. The corresponding percentages at the 3-digit and 2-digit level are 31 and 24 per cent respectively.

However, there is a variation in the importance of different activities. Although the SCo on an average produced in 5.8 different 4-digit industries, these industries do not seem to have been equally important. For, the number of industries in terms of NE(DB) is 2.3 only. (Recall that NE(DB) is the index value that would be the result of producing in the given number of industries to the same extent). A similar inference can also be drawn by contrasting the average values of the DI with those of DU and NE(DE). However, it should be noted that a part of the skewness in the relative contribution of different products may simply be due to the fact that a firm may have just then entered into a new product line and therefore may not have reached the intended production level. Hence, a certain amount of unevenness in the importance of different products is likely to be observed at any point of time.

The differences in the average values of indices at the same level as well as across different classification levels indicate that the significance of diversification in the economy is likely to vary, depending on the index used to measure it and the level of industry classification at which it is defined.

Further, there can be differences in the sensitivity of the indices to the level of classification. In particular, Gort index and gravity index seem to be more sensitive compared to other indices. For example, the average value of DG is 2.5 times as large at the 4-digit level than the 2-digit level, while for DI and DT the ratios are 1.7 and 3.8, respectively. This result is in consonance with some previous empirical findings as well.

The frequency distributions of the indices (not presented here) showed considerable differences both between indices of diversification and across levels of industry classification. In brief, the following broad features were exhibited by the frequency distributions:

(a) Indices, other than DS, DB, DE, and DT had highly skewed distributions, with frequencies dropping down sharply with an increase in the value of indices.

(b) With respect to all the indices, frequencies (number of companies) were concentrated in the lower tails of the distributions as the level of classification increased.

On the basis of simple correlation coefficients, presented in Appendix 5.C (Tables 5.C.1 to 5.C.3), it can be seen that all of the indices are closely related.[6] Further

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6. All the coefficients in these tables are significant at the .001 level.

examination of these tables suggests that the degree of pair-wise correlation, except for those involving Industry Count, increases with the increasing broadness of the industry level. Thus, the choice of an index becomes less relevant at an aggregate level of product classification.[7]

5.3 INDUSTRY-WISE LEVELS OF DIVERSIFICATION

The average values of the indices of diversification undoubtedly disguise considerable variations in the average diversification of different industry groups. This can be readily seen from Tables 5.2 to 5.4, which depict the industry wise average diversification values in terms of different indices at the 4-, 3-, and 2-digit level respectively.

Thus, the Industry Count for different industries varies from a low of 3.25 in the Cement industry to a high of 8.33 in case of the General Engineering industry. Other more diversified industries in a descending order are Miscellaneous, Paper, and Sugar industry. The highest degree of diversification exhibited by the General Engineering industry can be tentatively ascribed to the following factors. Firstly, the tempo of diversification might have been positively influenced by the governmental policy - commonly referred to as the 'broad banding' of industry- which was one of allowing

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7. These conclusions are consistent with those of Honeycutt and Zimmerman (1976) and Gorecki (1978).

TABLE 5.2

Average 4-Digit, Industry-wise Diversification, 1978

Industry	No. of cos.	Diversification Index					
		DI	DG	DB	DU	DE	DT
1. Automobiles	10	5.900 (2.547)	2.158 (1.729)	0.463 (0.159)	2.025 (0.594)	0.877 (0.314)	1.017 (0.621)
2. General Engg.	15	8.333 (3.977)	4.472 (2.792)	0.610 (0.222)	3.365 (1.443)	1.305 (0.544)	1.665 (0.596)
3. Chemicals	26	5.230 (2.749)	2.291 (1.807)	0.511 (0.197)	2.297 (0.815)	0.947 (0.403)	1.175 (0.527)
4. Cotton Spinning	6	3.833 (1.572)	0.991 (1.259)	0.313 (0.220)	1.608 (0.623)	0.669 (0.403)	0.878 (0.702)
5. Synthetic Fibre	10	5.700 (2.934)	2.061 (1.650)	0.441 (0.206)	2.074 (0.729)	0.851 (0.400)	1.144 (0.600)
6. Textiles	23	5.826 (2.258)	2.593 (2.171)	0.496 (0.219)	2.432 (1.186)	0.972 (0.479)	1.235 (0.657)
7. Sugar	13	6.307 (4.729)	2.995 (3.530)	0.436 (0.263)	2.517 (1.645)	0.930 (0.644)	1.302 (0.806)
8. Food Products	12	5.583 (1.891)	1.754 (1.473)	0.415 (0.170)	1.915 (0.630)	0.814 (0.341)	1.063 (0.466)
9. Cement	8	3.250 (1.561)	0.666 (0.645)	0.273 (0.199)	1.453 (0.371)	0.461 (0.310)	0.659 (0.456)
10. Jute Textiles	7	4.142 (1.355)	1.689 (0.944)	0.484 (0.115)	1.951 (0.461)	0.785 (0.257)	1.450 (0.341)
11. Paper	3	7.333 (1.247)	4.024 (1.517)	0.654 (0.118)	3.149 (0.887)	1.333 (0.263)	1.658 (0.252)
12. Miscellaneous	7	7.571 (2.770)	2.829 (1.986)	0.504 (0.196)	2.583 (0.947)	1.059 (0.412)	1.360 (0.500)

TABLE 5.3

Average 3-Digit, Industry-wise Diversification, 1978

Industry	No. of cos.	Diversification Index					
		DI	DG	DB	DU	DE	DT
1. Automobiles	10	4.200 (2.039)	1.237 (1.479)	0.308 (0.238)	1.596 (0.605)	0.540 (0.408)	0.554 (0.474)
2. General Eng.	15	6.133 (2.472)	3.085 (1.790)	0.587 (0.211)	2.909 (1.157)	1.180 (0.477)	1.055 (0.381)
3. Chemicals	26	4.423 (2.041)	1.725 (1.395)	0.457 (0.208)	2.053 (0.757)	0.821 (0.403)	0.664 (0.362)
4. Cotton Spinning	6	3.166 (1.343)	0.831 (1.105)	0.283 (0.243)	1.545 (0.609)	0.493 (0.440)	0.565 (0.482)
5. Synthetic Fibre	10	5.000 (2.366)	1.639 (1.490)	0.384 (0.226)	1.903 (0.765)	0.745 (0.440)	0.703 (0.417)
6. Textiles	23	4.565 (2.039)	1.662 (1.739)	0.387 (0.237)	1.948 (0.951)	1.721 (0.467)	0.738 (0.457)
7. Sugar	13	5.538 (3.499)	2.490 (2.787)	0.429 (0.256)	2.363 (1.438)	0.893 (0.603)	0.853 (0.522)
8. Food Products	12	5.000 (1.471)	1.381 (1.036)	0.374 (0.163)	1.723 (0.440)	0.711 (0.294)	0.647 (0.315)
9. Cement	8	3.250 (1.661)	0.666 (0.645)	0.273 (0.199)	1.453 (0.371)	0.461 (0.310)	0.385 (0.270)
10. Jute Textiles	7	4.000 (1.069)	1.619 (0.821)	0.483 (0.114)	1.942 (0.447)	0.780 (0.249)	0.966 (0.226)
11. Paper	3	6.333 (2.054)	2.727 (1.904)	0.517 (0.121)	2.249 (0.536)	1.008 (0.253)	1.003 (0.242)
12. Miscellaneous	7	6.142 (2.695)	1.835 (1.261)	0.441 (0.147)	2.065 (0.500)	0.856 (0.278)	0.838 (0.315)

TABLE 5.4

Average 2-Digit, Industry-wise Diversification, 1978

Industry	No. of cos.	Diversification Index					
		DI	DG	DB	DU	DE	DT
1. Automobiles	10	3.100 (1.135)	0.742 (0.907)	0.245 (0.255)	1.484 (0.595)	0.429 (0.428)	0.245 (0.255)
2. General Engg.	15	3.600 (1.143)	1.368 (0.825)	0.467 (0.188)	2.007 (0.579)	0.826 (0.346)	0.467 (0.188)
3. Chemicals	26	2.576 (1.245)	0.524 (0.731)	0.207 (0.227)	1.379 (0.493)	0.357 (0.375)	0.207 (0.227)
4. Cotton Spinning	6	2.833 (1.067)	0.724 (0.924)	0.281 (0.239)	1.515 (0.552)	0.472 (0.407)	0.281 (0.239)
5. Synthetic Fibre	10	4.000 (1.095)	1.015 (1.005)	0.319 (0.206)	1.647 (0.635)	0.604 (0.372)	0.319 (0.206)
6. Textiles	23	3.695 (1.487)	1.199 (1.211)	0.351 (0.226)	1.740 (0.713)	0.618 (0.402)	0.351 (0.226)
7. Sugar	13	4.076 (1.591)	1.522 (1.447)	0.397 (0.224)	1.963 (0.953)	0.754 (0.461)	0.410 (0.246)
8. Food Products	12	3.333 (1.178)	0.705 (0.676)	0.203 (0.170)	1.419 (0.299)	0.475 (0.262)	0.273 (0.170)
9. Cement	8	2.500 (1.118)	0.187 (0.203)	0.001 (0.131)	1.161 (0.192)	0.211 (0.200)	0.112 (0.131)
10. Jute Textiles	7	3.857 (0.989)	1.538 (0.746)	0.482 (0.112)	1.929 (0.433)	0.772 (0.239)	0.482 (0.112)
11. Paper	3	5.000 (1.414)	2.045 (1.502)	0.486 (0.123)	2.043 (0.504)	0.884 (0.218)	0.486 (0.123)
12. Miscellaneous	7	4.285 (1.577)	0.982 (0.489)	0.361 (0.156)	1.734 (0.328)	0.655 (0.235)	0.379 (0.170)

firms in this industry to alter their product-mix within the overall licensed capacity. Secondly, the very nature of this industry induces firms within it to produce in several technologically closely related 4-digit industries. For example, a manufacturer of Excavators (code 3511) may find it worthwhile to produce Loaders (code 3519) as well, not only because of the homogeneity of the technologies in their manufacture but also because of the relative ease in their marketing.

However, as was the case with the average diversification for the entire sample, the relative importance of the activities among different industry groups is seen to vary considerably. This can be inferred by comparing the values of the Utton index, (since it can be directly interpreted as a numbers-equivalent), with the DI values. It is because of this fact (skewed distribution of product shares) that some of the industry groups which were more diversified according to DI, become less diversified in terms of other indices, particularly DU.

The diversification rankings of the industry groups may be seen to vary with the level of classification. Thus, the Paper industry, though the second most diversified at the 4-digit level, exhibits the highest degree of average diversification at the 2-digit level according to the Utton index. Similarly, the most diversified General Engineering group at the 4-digit level acquires the third place in terms

of the Berry index.

A comparison of average values of the indices relating to the broader and finer levels of classification points toward the preponderance of conglomerate diversification among the industry groups. Thus, in the case of 9 groups out of 12, the ratio between the 2-digit entropy value and the corresponding value at the 4-digit level can be shown to have been above 0.6.

Companies in the Chemicals industry showed the least preference for unrelated diversification. A lesser tendency for unrelated diversification is also evidenced by Cement and Automobiles companies. The Sugar industry, on the other hand, exhibited the greatest propensity for the conglomerate form of diversification. This, however, is quite surprising. Perhaps it could be due to the presence of companies like Modi Industries and Triveni Engineering - which showed a high amount of unrelated diversification - in the Sugar industry sample.

An in-depth look at the industries in which the sample companies were active revealed some interesting features. Thus, the largest entry at the 2-digit level was into the Chemicals group (code 31). Thus, 17 out of 23 sample companies in the Textiles group produced chemicals also. Similarly, 8 Food Products companies were found to be active in code 31 (Chemicals). The corresponding numbers for the Sugar, Jute Textiles, and Paper were 5, 4, and 3 respectively.

After the Chemicals industry, the often chosen industries for diversification were Cement (code 32) and Basic Metal and Alloy Industries (code 33).

Further, there were differences in the nature of the product choice even among firms which chose conglomerate diversification. In this regard, the Textile companies (code 23) seemed to have moved into fields as diverse as Cement (code 32), Chemicals (code 31), and Basic Metal and Alloy Industries (code 33). On the other hand, companies dealing with Automobiles and General Engineering usually confined their diversification into closely related industry codes. For example, in the case of Automobiles companies (code 37) the diversification was into the Manufacture of Machinery and Machine Tools (code 35), Manufacture of Electrical Machinery (code 36), and Basic Metal Alloy Industries (code 33). Similarly, the General Engineering companies (code 35) were seen to have mostly diversified into codes 31, 33, 34, 36, and 37. The sample companies belonging to other groups showed mixed patterns with respect to the nature of conglomerate activities.

5.4 CHANGES IN DIVERSIFICATION, 1974-79

This section seeks to present the salient features of the changes in diversification for 126 sample companies over the period 1974-79. Table 5.5 exhibits the mean values of diversification indices of the 126 sample companies in 1974

TABLE 5.5

Average 4-, 3-, and 2-Digit Diversification, 126 Companies, 1974 and 1979

Index	4-Digit			3-Digit			2-Digit		
	1974	1979	% Change	1974	1979	% Change	1974	1979	% Change
DI	5.142	5.523	7.4	4.253	4.587	7.8	3.071	3.285	7.0
DS	0.344	0.358	4.3	0.286	0.314	10.0	0.216	0.237	10.1
DG	2.088	2.337	11.9	1.485	1.718	15.7	0.841	0.946	12.5
DB	0.452	0.471	4.2	0.384	0.415	8.1	0.294	0.317	7.8
NE (DB)	2.229	2.303	3.3	1.939	2.041	5.3	1.626	1.684	3.6
DU	2.236	2.296	2.7	1.926	2.003	4.0	1.587	1.633	2.9
DE	0.871	0.914	5.0	0.718	0.773	7.8	0.522	0.559	7.1
NE (DE)	2.691	2.809	4.4	2.294	2.414	5.2	1.838	1.902	3.5
DT	1.144	1.205	5.3	0.688	0.733	6.7	0.299	0.318	6.3

and 1979.

Every index in the table indicates that the average level of diversification increased perceptibly over the period under study. However, the percentage increase in the values of the indices of diversification show marked differences. Such differences, once again, underscore the influence of the choice of the index in representing the importance of diversified activities in the economy. However, this should not be taken to mean that any particular index is more preferable than others.

The index DI, at the 4-digit level, rose from 5.1 to 5.5 implying thereby that 126 companies on an average have added about one-tenth of a distinct product per year to their existing portfolios. Thus, the pace of diversification has been somewhat slow. If we make a discount for the unevenness in the significance of different activities for these companies, then the rate of increase of diversification would become still smaller. For instance, the per cent increase in NE(DB) is about half that of the DI.

Nevertheless, diversification does appear to have contributed significantly to the growth of these companies. The total sales of the 126 companies increased from Rs.3,624 crores to Rs. 6,824 crores between 1974-79. Of these, secondary activities accounted for Rs. 1,247 crores and Rs. 2,448 crores respectively in the two time periods. This implies that nearly 38 per cent of the rise in total sales

was due to the rise in the secondary output.

A somewhat greater rate of change in the indices at the 2-digit level in relation to the 4-digit level increases point toward a growing tendency for diversification into unrelated product lines. The ratio of the 2-digit entropy index value and its value at the 4-digit level increased from 60.0 to 61.1 in percentage terms between 1974 and 1979. A similar result was also reported in Jacquemin and Berry (1979, Table II, p. 363) for 460 large U.S. industrial corporations.

5.5 CONCLUSIONS

This chapter made an attempt to highlight some noteworthy features of the levels of diversification, and the changes in diversification over the period 1974-79. The calculation of the indices for this purpose, however, was done after making certain improvements in the methodological issues regarding the measurement of diversification. Broadly the following features have been observed with regard to diversification of the sample companies.

(a) The measured values of all the indices in 1978, indicat that diversification has been an important mode of growth for the sample companies on an average. Thus, about 36 per cent of the total sales of the SCo have been from their secondary activities. However, the observed significance of diversification is affected by both the index used in its

measurement and the industry level at which it is defined.

(b) All the secondary activities for the SCo, however, were not equally important.

(c) Contrary to expectations, diversification has been more into conglomerate product lines rather than into related 4-digit industries within a broader 2-digit industry.

(d) There was a considerable variation in the average diversification among different industries. Similarly, differences were observed with respect to the patterns of diversification among the SCo classified by their base industry.

The various indices of diversification computed for the SCo here can now be utilized in the empirical verificatio of the hypotheses on the determinants of diversification. This has been attempted in the next three chapters.

APPENDIX 5.A

SUMMARY OF DIVERSIFICATION MEASURES EMPLOYED IN THE STUDY

Index	Definition
Industry Count (DI)	N
Secondary Specialization Ratio (DS)	$\frac{S}{P+S}$
Gort (DG)	$N(1 - \frac{P}{P+S})$
Berry (DB)	$1 - \sum_{i=1}^{n} P_i^2$
Numbers-Equivalent (Berry) (NE(DB))	$\frac{1}{1-DB}$
Utton (DU)	$2 \sum_{i=1}^{n} i\, P_i - 1$
Entropy (DE)	$\sum_{i-1}^{n} P_i \cdot \ln \frac{1}{P_i}$
Numbers-Equivalent (entropy)	antilog DE
Gravity	$\sum_{i-1}^{n} P_i \sum_{j=1}^{n} P_j \cdot d_{ij}$

where,

N = Number of different industries in which a company produces

P = the proportion of a company's output accounted for by its primary industry

S = the proportion of a company's output accounted for by its secondary industries

P_i – the proportion of company's output accounted for by the ith industry.

d_{ij} – the weight assigned depending on the differences between industry i and j.

The weights are assigned in the following manner:

Weight		Industry i	Industry j
$d_{ij} = 0$	if	2011	2011
$d_{ij} = 1$	if	2011	2012
$d_{ij} = 2$	if	2011	202x
$d_{ij} = 3$	if	2011	21xx
$d_{ij} = 3$	if	2011	3xxx

where x can be any number between 0 and 9.

Thus, no additional importance is given to a difference in the first digit of industry codes.

APPENDIX 5.B

DATA PROCESSING FOR THE CALCULATION OF DIVERSIFICATION INDICES

The indices of company diversification reported in this chapter are based on product-wise sales turnover data as reported in various annual reports of companies. Reporting of this type of information was made obligatory for companies in 1973. Thus, such data are available mostly since 1974 onwards. However, companies apparently do not seem to use a standardized classification of products for this purpose. As a result, sometimes, certain products are grouped together or reported sales figures refer to some broad heads. Thus, an exact classification of company's products into industry codes is rendered difficult. This gets further compounded as the NIC does not provide a list of products pertaining to a particular industry.

The last mentioned difficulty was overcome to a significant extent by making use of the Central Statistical Organization (CSO) publication "Common Product Nomenclature for Agriculture, Mining, and Manufacturing Sectors." However, the very nature of the data necessitated exercising some amount of judgement in the classification of products into distinct industry codes. The guidelines adopted in this context were as follows:

(a) Sales from 'waste', 'scrap', 'slag' etc. were assigned to the company's primary industry.

(b) Unless the by-products were named explicitly, they were added to the company's primary output.

(c) Sales given under such heads as 'processing charges', 'lease income', and 'service charges' were clubbed together with the primary activity.

(d) Sales reported under categories like, miscellaneous, others, consultancy, and trading were classified into a dummy industry code 6000.

(e) In circumstances, where products could not be matched with the CSO nomenclature, use was made of the personal knowledge in their classification.

(f) Whenever a company's products happened to be reported under broad or ambiguous heads, use was made of personal knowledge of company's activities. For example, if a firm reported sales from basic chemicals it would not be clear whether chemicals were of inorganic or organic type.

(g) Products which were internally consumed were not considered in arriving at the product profile of the company. Thus, vertically integrated products were eliminated.

A profile of sales by products was thus prepared for each company. However, in case a company reported sales turnover in different plants or units, then the actual sales from individual products in distinct industries in which the units produced, were aggregated to form an over-all

product-wise sales profile of the company. Later on, sales from different products classified into the same 4-digit industry were added. In this way, the company's sales profile at the 4-digit level was generated and utilized in the calculation of different indices. Correspondingly, to obtain 3- and 2-digit sales profile, the appropriate right hand digits were dropped from the 4-digit code, and sales from identical remaining codes collapsed.

In the first instance, sales profiles of companies included only those products which were actually manufactured (that is, those for which companies reported installed capacities and production figures) by companies. The indices calculated on this basis have, however, not been presented in the study.

It was, however, realised that exclusion of residual sales attributable to marketing, consultancy etc., may cause underestimation of a company's diversification. For, trading or marketing might have been a consequence of utilization of excess resources in the marketing division of the company. Similarly, consultancy activities may be expected to have been a result of spare technical resources of the firm. More significantly, a company, at times, may enter into an exclusive 'buy-back' arrangement with some other unit, possibly to circumvent or by pass licensing regulations. However, since all the major functions such as, finances, marketing, quality control, product development

etc., are retained by the company, it is reasonable to brand it as a diversification venture. This, in fact, is common practice with many companies like Bajaj Electricals, Voltas etc.

Therefore, in this study, use has been made of indices calculated by utilizing sales profile that includes manufactured products as well as non-manufactured ones.[1,2]

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1. The differences of means tests between the two sets of calculated indices were conducted to ascertain whether this adjustment led to any marked divergences. None of the tests, however, proved to be significant at even 75 per cent level of confidence.

2. The residual sales were reported in case of 99 companies. The percentage of such sales in the total sales, however, varied mostly between 0.5 to 3.0 per cent.

APPENDIX 5.C

CORRELATION TABLES

TABLE 5.C.1

Simple Correlation Coefficients Matrix of the 4-Digit Indices of Diversification, 140 Companies, 1978.

Index	DI	DS	DG	DB	NE (DB)	DU	DE	NE (DE)	DT
DI	1.000	0.553	0.890	0.615	0.676	0.805	0.778	0.816	0.649
DS		1.000	0.816	0.978	0.910	0.855	0.920	0.843	0.909
DG			1.000	0.825	0.914	0.965	0.930	0.969	0.827
DB				1.000	0.888	0.861	0.956	0.859	0.929
NE (DB)					1.000	0.961	0.936	0.958	0.836
DU						1.000	0.956	0.996	0.840
DE							1.000	0.960	0.909
NE (DE)								1.000	0.838
DT									1.000

TABLE 5.C.2

Simple Correlation Coefficients Matrix of the 3-Digit Indices of Diversification, 140 Companies, 1978

Index	DI	DS	DG	DB	NE (DB)	DU	DE	NE (DE)	DT
DI	1.000	0.563	0.857	0.618	0.658	0.744	0.757	0.776	0.650
DS		1.000	0.850	0.979	0.918	0.883	0.933	0.865	0.907
DG			1.000	0.848	0.924	0.955	0.931	0.963	0.837
DB				1.000	0.894	0.876	0.963	0.872	0.930
NE (DB)					1.000	0.977	0.939	0.966	0.826
DU						1.000	0.953	0.995	0.838
DE							1.000	0.960	0.913
NE (DE)								1.000	0.838
DT									1.000

TABLE 5.C.3

Simple Correlation Coefficients Matrix of the 2-Digit Indices of Diversification, 140 Companies, 1978

Index	DI	DS	DG	DB	NE (DB)	DU	DE	NE (DE)	DT
DI	1.000	0.595	0.791	0.652	0.663	0.697	0.748	0.747	0.658
DS		1.000	0.902	0.980	0.957	0.933	0.947	0.913	0.977
DG			1.000	0.889	0.960	0.961	0.931	0.964	0.894
DB				1.000	0.936	0.918	0.978	0.921	0.997
NE (DB)					1.000	0.985	0.954	0.976	0.938
DU						1.000	0.956	0.991	0.930
DE							1.000	0.972	0.982
NE (DE)								1.000	0.932
DT									1.000

CHAPTER 6

A FRAMEWORK FOR THE EMPIRICAL ANALYSIS

6.1 THE REGRESSION MODEL

As mentioned in chapter 3, diversification decisions of the firm were asserted to be a net outcome of the incentives and impediments created by both external and internal factors constituting the total environment of the firm. In particular, we emphasized the role of the firm specific determinants of diversification. Those firm specific and its primary industry related variables can be incorporated in the following model to study firm's diversification behaviour.

$$D = f\,[\,SAL,\ EOS,\ SRS,\ RRC,\ MEC,\ ADI,\ CUR,\ MRT,\ GR3,\ CON\,] \qquad (6.1)$$

where

D is the degree of diversification.

We postulate the functional form of this relationship to be linear and additive. Thus, we can write the general regression model as,

$$D_i = b_1 \cdot SAL_i + b_2 \cdot EOS_i + b_3 \cdot SRS_i + b_4 \cdot RRC_i + b_5 \cdot MEC_i + b_6 \cdot ADI_i + b_7 \cdot CUR_i + b_8 \cdot MRT_i + b_9 \cdot GR3_i + b_{10} \cdot CON_i + u_i \; ; \; i = 1, \ldots, n \qquad (6.2)$$

where,

D_i - Diversification of the ith firm

u_i - The error term.

A preliminary scanning of the data on different variables for the cross-section of the sample companies suggested the presence of heteroscedasticity. To make the estimates of regression parameters efficient and unbiased, we sought to purge equation (6.2) of the heteroscedastic disturbances by deflating[1] it by the size of the firm, that is, by assuming variance of u_i to be proportional to the square of sales (size) of the firm, SAL_i. That is, variance $(u_i) = \sigma^2 SAL_i^2$. Thus, equation (6.2) after deflation becomes

$$\frac{D_i}{SAL_i} = b_1 + b_2 \cdot \frac{EOS_i}{SAL_i} + b_3 \cdot \frac{SRS_i}{SAL_i} + b_4 \cdot \frac{RRC_i}{SAL_i} + b_5 \cdot \frac{MEC_i}{SAL_i} + b_6 \cdot \frac{ADI_i}{SAL_i} + b_7 \cdot \frac{CUR_i}{SAL_i} + b_8 \cdot \frac{MRT_i}{SAL_i} + b_9 \cdot \frac{GR3_i}{SAL_i} + b_{10} \cdot \frac{CON_i}{SAL_i} + v_i \; ; \; i = 1, \ldots, n \qquad (6.3)$$

where the new residual is now

$$v_i = \frac{u_i}{SAL_i} \quad \text{and} \quad var(v_i) = \frac{1}{SAL_i^2} \; var(u_i) = \sigma^2$$

Notice that the constant term in the above transformed equation measures the slope coefficient of the SAL variable in the original equation (6.2).

---

1. Transforming variables into logarithms, as opposed to deflation, was not considered suitable. For, though it would have made the residuals more homoscedastic it would have introduced non-linearity in the model. For details, see Maddala (1977, Ch. 12), Griliches (1972), and Tukey (1957).

Thus, in later estimations, only deflated regression equations have been used. For the sake of convenience, equation 6.3 can be written as

$$D_i' = b_1' + b_2'.EOS_i + b_3'.SRS_i + b_4'.RRC_i + b_5'.MEC_i + b_6'.ADI_i + b_7'.CUR_i + b_8'.MRT_i + b_9'.GR3_i + b_{10}'.CON_i + V_i \quad ; \; i = 1, \ldots, n \qquad (6.4)$$

where b_i''s represent the coefficients on various deflated explanatory variables, and D_i' is the deflated diversification index.

Multicollinearity, on the other hand, did not appear to pose a serious problem despite relatively high correlations (greater than 0.5) between SAL and SRS, and SAL and MRT.[2]

In the later chapters, regression equations incorporating various sub-sets of explanatory variables given in (6.4) have been estimated and analysed. All regression equations have been estimated by using the classical least squares method.

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2. The usual symptoms associated with multicollinearity were not found in the results to a significant extent. Thus, the parameter estimates did not change very much with the addition of new data points. Similarly, the estimated coefficients of the explanatory variables were not very sensitive to the inclusion or exclusion of other explanatory variables. Lastly, high F-statistic was mostly accompanied by reasonably high t-values of various parameters.

The sources and other aspects of data for the explanatory variables used in the regression analysis are given in Appendix 6.A.

6.2 SPECIFICATION OF REGRESSION EQUATIONS

That there might be differences in the explanatory power of various determinants of diversification across firms grouped by industry, as suggested in our discussion on the determinants, has been ascertained by carrying out industry specific analysis. For example, capacity utilization rate (CUR) was shown to be particularly more significant in case of firms where plant could be easily adapted to the manufacture of other products. In particular, firms in the Automobiles and General Engineering industry were cited as examples in this regard. Similarly, Economies of Scope (EOS) were stated to be relatively important in fabrication and processing industries. Managerial Excess Capacity (MEC), on the other hand, though more general, compared to other determinants as regard to its effect on the degree of diversification across firms in different industries, would still be expected to have varying influences on diversification among firms in each of the different industries. This emerges from the way we defined MEC. Since, it also included R & D and marketing constituents of the firm, this variable was expected to be of less consequence wherever R & D and marketing skills were not much required.

Non-availability of data with regard to certain variables, and insufficient sample sizes, dictated that industry specific analysis be carried out for the following 5 industry groups only. These groups were: (1) Automobiles, (2) General Engineering, (3) Chemicals, (4) Textiles, and (5) Sugar. Thus, for industry specific analysis, the following equation was specified and estimated.[3]

$$D_i = b'_1 + b'_2 \cdot EOS_i + b'_3 \cdot SRS_i + b'_4 \cdot RRC_i + b'_5 \cdot MEC_i + b'_6 \cdot CUR_i + b'_7 \cdot MRT_i + v_i \; ; \; i = 1, \ldots, n$$

In the second part of the analysis, all companies belonging to different industries were pooled together for estimating equations incorporating primary industry related variables, in addition to firm specific variables.[4] Since the data with respect to CUR and ADI was not available for all the 140 companies, the total sample was further disaggregated into various sub-samples. Sub-sample 1 relates to 59 companies for which data on ADI was available and sub-sample 2 has 81 companies with data on CUR. Later on, 27 of the 59 firms, for which data existed with regard to the CUR variable also, were used to form sub-sample 3. Thus, the following equations havebeen estimated for various pooled samples.

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3. Excepting Textile and Sugar industries, where CUR variable was not used for want of reliable data.

4. Except the EOS variable.

(a) Total Sample, 140 Companies

$$D_i = b'_1 + b'_2 \cdot SRS_i + b'_3 \cdot RRC_i + b'_4 \cdot MEC_i + b'_5 \cdot MRT_i + b'_6 \cdot GR3_i + b'_7 \cdot CON_i + v_i \; ; \; i = 1, \ldots, 140$$

(b) Sub-Sample 1, 59 Companies

$$D_i = b'_1 + b'_2 \cdot SRS_i + b'_3 \cdot RRC_i + b'_4 \cdot MEC_i + b'_5 \cdot MRT_i + b'_6 \cdot ADI_i + b'_7 \cdot GR3_i + b'_8 \cdot CON_i + v_i \; ; \; i = 1, \ldots, 59.$$

(c) Sub-Sample 2, 81 Companies

$$D_i = b'_1 + b'_2 \cdot SRS_i + b'_3 \cdot RRC_i + b'_4 \cdot MEC_i + b'_5 \cdot CUR_i + b'_6 \cdot MRT_i + b'_7 \cdot GR3_i + b'_8 \cdot CON_i + v_i \; ; \; i = 1, \ldots, 81$$

(d) Sub-Sample 3, 27 Companies

$$D_i = b'_1 + b'_2 \cdot SRS_i + b'_3 \cdot RRC_i + b'_4 \cdot MEC_i + b'_5 \cdot ADI_i + b'_6 \cdot CUR_i + b'_7 \cdot MRT_i + b'_8 \cdot GR3_i + b'_9 \cdot CON_i + v_i \; ; \; i = 1, \ldots, 27.$$

The regression analysis has been conducted using 1978 values of diversification indices. The choice of the year for the analysis was exclusively governed by the availability of the relevant data.

In the next chapter, we discuss the empirical results based on industry specific regressions at various levels of industry classification.

APPENDIX 6.A

NOTES ON DATA FOR THE EXPLANATORY VARIABLES USED IN ANALYSIS OF DIVERSIFICATION

The data for the explanatory variables employed in this study was obtained from several published sources. The availability of data, however, was not sometimes in an appropriate form. This, consequently, has resulted in the following;

(a) in some cases, we have been compelled to make use of rather approximate surrogates for the effects actually sought to be captured,

(b) the lack of data has also prevented us from utilizing - conceptually and intuitively more justified- longer period lagged values in respect of some variables, and

(c) the industry specific regression analyses could not be conducted for more than five individual industries. Further, not all variables specified by theory as relevant could be included in the analysis due to the paucity of data.

These limitations notwithstanding, the empirical results showed, that the findings might not have been affected significantly due to weaknesses in the data base. Before we describe the nature and sources of data, it should be recorded that some adjustments were made in data. They are: (i) wherever relevant data were reported for a time period which is different from the calendar or accounting year, we utilized

the values worked out on the pro rata basis for 12 months, and (ii) in cases where certain observations were missing, simple linear interpolation was used. However, the need for such interpolation was very limited.

(a) Company Size (SAL)

The size of the company was defined as the 1978 net sales (in Rs.) X 10^{-6}. The data on net sales were obtained from various issues of the Stock Exchange Official Directory.

(b) Shareholders' Reserves and Surplus (SRS)

The SRS, as defined in the Stock Exchange Official Directory, includes Capital Reserves, Sinking Fund and Redemption Reserves, Statutory Development Rebate, Free Reserves, and Surplus/Deficit, if any. This variable was entered as 1978 SRS (in Rs.) X 10^{-6} in the computations.

(c) Rate of Return on Total Capital Employed (RRC)

The source for this ratio was the same as in (a) and (b) above. The ratio is defined as

$$RRC = \frac{\text{Debenture Interest + Other Interest + Net Profit}}{\text{Networth + Debentures + Long-term Loans + Loans and Advances}} \times 100$$

A simple five year average of the RRC was used in the analysis.

(d) Managerial Excess Capacity (MEC)

This was represented by the ratio between expenditure on managerial personnel and net sales of the company. Annual

Reports of companies give expenditures incurred on employees who were in receipt of remuneration exceeding Rs.36,000 per annum and were employed throughout the year. A scrutiny of the nature of duties of such employees indicated that they belonged to the middle managerial cadres and higher echelons of the company.[1] Hence, such employees could be assumed to form the bulk of the managerial resources of a firm. It should, however, be noted that such personnel belonged to all divisions of the company. Therefore, the MEC variable is adequate to capture the effect of unused resources in divisions like Research and Development, Marketing etc. as well.

Since data with regard to expenditures on employees was available only from 1974 onwards an average of the MEC over 1974-78 was used in the calculations.

(e) Advertising Intensity (ADI)

The figures for expenses on advertising were taken from the Annual Reports of the respective firms. In some cases, reported advertising expenditures also included expenditures on printing and stationery. No adjustments could be made in this regard. Besides data on this variable was available for 59 companies only. These companies belonged

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1. With respect to the non-managerial personnel, it was assumed that the proportion of such personnel to managerial personnel was the same in all companies.

(h) Growth Rate of the Primary Industry (GR3)

Unlike the above variables, which would be unaffected by the level of industry classification, growth rate needed to be measured at various levels of product classification. This, however, could not be done as appropriate and reliable data were available for 3-digit level only. This variable at the 3-digit level was measured as the proportionate growth in industry's value of output between 1974-78. The growth rate over a longer period, although desirable, could not be calculated since in the CSO "Annual Survey of Industries 1977-78 Summary Results" data on the value of output, at the 3-digit level, were available on a uniform and comparable basis from 1973-74 onwards only.

(i) Concentration in the Primary Industry (CON)

Appropriate data on concentration were not available at all in published sources. Moreover, most of the studies seem to have looked at the concentration in a fallacious way. In fact, the concentration of a particular market should be judged by the relative size of the largest sellers within that market, that is, by the concentration of sales, not by any measure of the relative, or absolute, size of the firms that are the largest sellers. The size of a particular firm in terms of its total sales or total assets is irrelevant to the determination of the relative contribution of its sales within a particular market. The distortion caused - when total assets or sales of the firm are considered - in measuring

concentration will be much more if diversified firms happen to dominate that industry or market. For instance, if one were to find concentration in the electronic computer industry (code 3661), then counting of total assets of the DCM, a producer of computers also, would lead to a very high level of concentration in this industry.

Therefore, we have preferred to measure concentration in terms of actual sales of the firms in a particular product market. For this purpose, a four-firm concentration measure was employed. The requisite data were taken from the Economic Intelligence Service "Market and Market Shares", Bombay : CMIE, 1980. However, no attempt was made to calculate concentration at the industry- level as coverage of products in the source was not available for all products belonging to a particular industry. The concentration ratios used in the study refer to 1978.

(j) Institutional Factors (MRT)

The MRT dummy variable was assigned a value 1 if the company was registered under the MRTP Act, 1969 in the year 1978.[2] In the rest of the cases, the variable took a value 0. The MRTP companies were identified on the basis of information given in EIS "1033 MRTP Companies", Bombay: CMIE, 1978.

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2. The use of current period values of the variables can be justified on the grounds, that when a company gets into a cumulative process of diversification, based upon a high value of a variable in the past, an observation at any instant would show a substantial amount of diversification accompanied by a high value of the variable in question.

CHAPTER 7

THE EMPIRICAL FINDINGS : INDUSTRY SPECIFIC RESULTS

7.1 INTRODUCTION

This chapter deals with the presentation and discussion of the empirical results obtained for industry specific samples. The focus of the analysis is on the identification of the relative importance of various firm specific determinants in different industry groups. In addition, MRT dummy variable - which is used in this study to capture the influence of certain company specific regulatory legislations - has also been included in the specification. This is done to see if regulations have differentially affected firms' diversification in different industries, as has been suggested by Choudhury et al. (1982).

The number of industry samples suitable for the estimation purpose was limited by both the small sample size and availability of the requisite data. Thus, out of 12 industry groups, for which we computed indices of diversification, only five fulfilled the criteria of possessing an adequate sample size and availability of data for the largest number of explanatory variables. These industry groups are: (1) Automobiles Industry, (2) General Engineering Industry, (3) Chemicals Industry, (4) Textile Industry, and (5) Sugar Industry. Samples for these industry groups consist of 10, 15, 26, 23, and 13 companies in that order.

Even with respect to these 5 industry groups, data on certain variables was lacking. Thus, complete coverage was not available in the case of Advertising Intensity (ADI) for any of the samples chosen. Similarly, for the Textile and Sugar industry meaningful figures on the capacity utilization rate could not be calculated. Except these two, the data on other firm specific variables was available for all the 5 industry samples selected for the analysis.

A perusal of the data for various industry samples revealed a considerable amount of heterogeneity, both within the sample as well as across the samples. Within the samples, firm size (SAL) and shareholders' reserves and surplus (SRS) showed much greater variation compared to other explanatory variables. The Coefficient of Variation of the SAL variable ranged from 64 per cent in the case of Sugar industry to 142 per cent in the Chemicals industry. The SRS variable exhibited even greater variability than was observed for the SAL variable. On the other hand, economies of scope exhibited the least variation among the explanatory variables.

Further, the simple correlation coefficients between different pairs of the explanatory variables were of a lower order of magnitude (less than 0.3), except for the pairs SAL-MRT and SAL-SRS. However, for these two pairs the values of correlation coefficients were below 0.7.

The possibility of obtaining broadly consistent results for different industries with respect to the importance of

various determinants of diversification from an analysis of such diverse samples is explored in the following section.

7.2 THE REGRESSION RESULTS: 4-DIGIT LEVEL

The regression results obtained for various industry samples at the 4-digit level of industry classification are presented in Tables 7.1(a) to 7.1(e). Each one of these tables refers to the regression results for a particular industry sample.[1] The regression equations reported in these tables, as well as other tabulations in this chapter, were selected in the following manner. We computed all the possible regressions that could be formed from the set of explanatory variables, as specified in the previous chapter: these variables are SAL, EOS, SRS, RRC, MEC, CUR, and MRT. But in the case of Sugar and Textile industries, the CUR variable was omitted from the specification. Thus, we computed 127 regressions each for Automobiles, General Engineering, and Chemicals industry.[2] For the remaining industry samples, the number of computations was 63. Two criteria were used in the selection of equations for the purpose of interpretation. Firstly, t-values for all the

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1. Wide differences in the values of coefficients of variables in these tables as well as the following ones are primarily due to differences in the units of measurement of the variables.

2. This was calculated as $(2^k - 1) = 127$, where k is the number of regressors.

TABLE 7.1(a)

Regression Results: 4-Digit Level, the Automobiles Industry, 1978.

Explanatory Variable	Dependent Variable and Equation Number					
	DI 1	DG 2	DB 3	DU 4	DE 5	DT 6
SAL	0.016 (1.178)	0.011 (1.332)	0.002 (1.818)	0.002 (0.951)	0.949×10^{-3} (0.722)	0.013 (3.556)**
EOS	9.233 (5.623)**	4.226 (3.091)*	0.978 (3.332)*	5.535 (11.56)**	2.646 (12.29)**	
SRS			-0.019 (-1.930)			-0.100 (-4.365)**
RRC			0.003 (1.584)			0.032 (6.771)**
MEC	270.3 (2.186)*	108.4 (1.040)	35.96 (3.589)*	107.0 (2.933)*	57.36 (3.496)**	104.9 (4.031)**
CUR	-0.012 (-3.794)**	-0.010 (-3.715)**	-0.002 (-6.775)**	-0.008 (-8.835)**	-0.005 (-11.75)**	-0.005 (-7.324)**
MRT	0.979 (1.000)					
$\bar{R}^2$	0.959	0.664	0.990	0.984	0.979	0.977
F-Ratio	45.12**	5.672*	157.8**	163.5**	121.4**	82.17**
df	5	6	4	6	6	5

NOTE: The following applies to all the subsequent tabulations.

(a) The t-ratios are shown in parentheses.

(b) The figures above the t-ratios represent coefficients of the corresponding variables.

(c) All t-tests are one-tailed except SRS, RRC, GR3, and MRT which are two-tailed.

(d) $\bar{R}^2$ is tested by F-test.

(e) ** indicates significance at .01 level.

(f) * indicates significance at .05 level.

TABLE 7.1(b)

Regression Results: 4-Digit level, the General Engineering Industry, 1978.

Explanatory Variable	Dependent Variable and Equation Number					
	DI 1	DG 2	DB 3	DU 4	DE 5	DT 6
SAL	0.065 (0.426)	0.127 (2.042)*	0.016 (3.772)**	0.078 (2.320)*	0.037 (3.283)**	0.046 (4.239)**
EOS	9.247 (4.931)**	7.788 (3.596)**	0.761 (2.466)*	5.517 (4.678)**	1.245 (1.587)	1.892 (2.515)*
SRS	1.415 (1.169)					
RRC						
MEC			25.95 (1.276)		65.49 (1.267)	79.06 (1.595)
CUR	-0.072 (-2.544)*	-0.058 (-2.455)*	-0.012 (-6.391)**	-0.035 (-2.689)*	-0.023 (-4.883)**	-0.032 (-7.139)**
MRT		-1.696 (-1.363)		-0.752 (-1.110)		
R^2	0.713	0.524	0.886	0.723	0.818	0.904
F-Ratio	11.29**	5.331*	34.13**	11.81**	19.84**	41.01**
df	11	11	11	11	11	11

TABLE 7.1(c)

Regression Results: 4-Digit Level, The Chemicals Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number					
	DI 1	DG 2	DB 3	DU 4	DE 5	DT 6
SAL	0.348 (4.124)**	0.175 (3.302)**	0.023 (2.068)*	0.102 (2.650)**	0.053 (3.226)**	0.033 (1.378)
EOS	4.054 (7.683)**	1.955 (5.901)**	0.373 (3.276)**	1.542 (3.875)**	0.883 (8.881)**	0.577 (2.602)**
SRS	-1.608 (-3.092)**	-0.911 (-2.790)*	-0.106 (-1.828)	-0.435 (-2.142)*	-0.221 (-2.282)*	-0.134 (-1.016)
RRC			0.010 (1.143)	0.041 (1.282)		
MEC						43.87 (2.356)*
CUR						
MRT	2.264 (1.082)	1.391 (1.059)				
$\bar{R}^2$	0.728	0.616	0.746	0.801	0.772	0.724
F-Ratio	22.07**	13.44**	24.09**	32.86**	41.08**	21.63**
d.f.	22	22	22	22	23	22

TABLE 7.1(d)

Regression Results: 4-Digit Level, The Textile Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number					
	DI	DG	DB	DU	DE	DT
	1	2	3	4	5	6
SAL	0.071 (3.052)**	0.058 (3.908)**	0.006 (3.401)**	0.031 (4.027)**	0.021 (3.673)**	0.026 (4.370)**
EOS	3.911 (1.685)	-1.909 (-1.275)	0.385 (1.112)	1.030 (1.074)	0.963 (3.385)**	-0.845 (-1.404)
SRS	-0.162 (-1.376)	-0.097 (-1.275)			-0.035 (-1.450)	-0.045 (-1.475)
RRC			-0.007 (-1.035)			
MEC	312.6 (3.047)**	222.6 (2.259)*	26.54 (1.553)	111.7 (1.758)*		126.5 (3.193)**
MRT					-0.367 (-1.725)	
$\bar{R}^2$	0.639	0.203	0.399	0.478	0.408	0.400
F-Ratio	12.96**	2.407	5.271**	10.09**	5.440**	5.282**
df.	19	19	19	20	19	19

TABLE 7.1(e)

Regression Results: 4-Digit Level, the Sugar Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DB 2	DE 3	DT 4
SAL	0.169 (2.210)*	0.001 (0.347)	0.006 (0.630)	0.006 (0.487)
EOS		0.860 (2.977)**	1.593 (2.308)*	2.440 (2.753)*
SRS	0.896 (1.473)	0.101 (2.786)*	0.194 (2.237)	0.280 (2.508)*
RRC	-0.214 (-1.451)	-0.024 (-2.929)*	-0.044 (-2.204)	-0.071 (-2.748)*
MEC	530.9 (2.299)*	25.75 (1.542)	47.77 (1.198)	79.69 (1.557)
MRT				
$\bar{R}^2$	0.269	0.751	0.639	0.723
F-Ratio	1.929	8.738**	5.403*	7.631**
df.	9	8	8	8

variables, excepting the firm size[3], should have been greater than 1.0. Secondly, the equation should have yielded the highest value of $\bar{R}^2$. However, in order to keep the burden of computations within manageable proportions, only few indices were alternately used as the dependent variable in the regressions. Further, the analysis was conducted at different levels of industry definition.

The reason behind conducting the analysis at different levels, even as the values of the explanatory variables remained the same throughout, was to examine the sensitivity of the empirical findings to industry levels at which diversification is measured.

In terms of the overall significance of the regression equations at the 4-digit level, we notice that the results are quite satisfactory in the sense that the $\bar{R}^2$ values are reasonably high, barring a few cases. Thus, equation 2 for the Textile industry and equation 1 in the case of the Sugar industry did not have a significant $\bar{R}^2$ at the 5 per cent level of significance. In fact, in the case of Sugar industry, we did not find any of the regressions to be significantly

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3. Recall that we have made use of deflated equations all along. Thus, the firm size variable would be present in all the estimated equations (since the constant term, which measures the slope coefficient of the variable used as a deflator, will always be there). It was noticed that, in some cases, t-values for the SAL variable were less than 1.0 in all the regressions computed with a particular index as the dependent variable. Hence, this criterion was not applied for the firm size variable.

different from zero when Gort and Utton indices were used as the dependent variables.

Among the explanatory variables, the most consistent is firm size, which always has the predicted positive association with diversification. Its significance, however, varies across different industry results as well as in different equations for the same industry.

In the empirical results for the Automobiles industry, firm size does not appear to be important except when DT was used as the dependent variable. However, it is seen as consistently statistically significant at 95 per cent level or more in the case of the General Engineering industry. A similar result can be seen for Chemicals and Textile industries. But the firm size, in the case of the Sugar industry, is not significant in any of the other equation except the equation 1. In sum, the firm size seems to exert varying influence on the diversification of firms in different industries.

Previous studies recorded similar results. For example, Gorecki (1978) obtained different results with respect to firm size in an analysis of samples consisting of domestic and foreign-owned enterprises in the Canadian Food Processing sector.

The economies of scope can be seen to be positively linked with diversification as envisaged. Further, it is

consistently significant at the 95 per cent level of significance or more in three industries; namely, Automobiles, General Engineering, and Chemicals industry. Similar is the case for the Sugar industry. In the case of the Textile industry, however, it is not significant in equation 5, and has a negative sign on it in equations 2 and 6 though it is not statistically significant. Thus, for this industry sample, the result obtained for the EOS variable is somewhat weaker.

Yet another variable which always shows the expected positive association with diversification is the managerial excess capacity. This variable is consistently significant at .05 level in the case of the Automobiles industry. In results for the Chemicals industry it is present in equations 3, 5 and 6, and is positive but not statistically significant. Similarly, in the Textile industry we find the coefficient on the MEC variable as positive and significant in the first four equations. However, it is mostly insignificant, though positive throughout in the Sugar industry.

With respect to this determinant, we notice that it shows up in only one equation in the case of the Chemicals industry. Its relative insignificance here can be tentatively attributed to the relative dominance of firms with substantial foreign links in this sample. For, such firms may not feel the compulsion to develop internal skills since they can draw upon the experience of their associates as and when the need arose. In addition, the percentage of such firms in this

sample was as high as 46.2 in contrast to less than 10 per cent observed in other industries.

Capacity utilization rate exhibits the anticipated negative and strong relationship with all indices of diversification in both the Automobiles and the General Engineering industry. In the case of the Chemicals industry, however, it did not show up in any of the regressions selected, which is not surprising in view of the relative inflexibility in switching over from one product to another in case of continuous processing industries such as Chemicals, Cement, and Petroleum industries.

Of the remaining variables in the regressions, the coefficient on shareholders' reserves and surplus presents conflicting results. Moreover, it is not statistically significant in many cases. But in the case of the Chemicals industry it is seen to be significant in 4 of the 6 equations, and is negatively associated with diversification. This, however, is somewhat contrary to our a priori expectation. It should be recalled that we did not posit a definite nature of relationship between diversification and SRS, RRC, GR3, and MRT variables, because of certain conflicting inter-relationships with regard to the effect of the above four variables on the degree of firm's diversification. However, we did suggest the more likely possibilities. Thus, both the SRS and the RRC variables were expected to be positively associated with diversification.

The empirical results with respect to the MRT variable indicate that this variable has been of little consequence as far as diversification is concerned. For example, it is present in only equation 1 in the case of the Automobiles industry. Further, it is positive but is not statistically significant. On the other hand, the MRT variable, in the case of General Engineering industry, is present in equations 2 and 4. But, in both cases, it shows a negative association with the degree of diversification. However, the coefficients are not significant at even .05 level of significance. In the case of Sugar industry, this variable is not present in any of the reported equations. The absence of any significant relacionship between the MRT variable and diversification suggest that, various regulatory legislations, especially the MRTP Act, 1969 do not affect the firm's diversification in either way.[4]

The coefficient of the RRC variable, used as a measure of the profitability of the firm, is mostly positive and statistically insignificant, except in the case of Sugar industry. In this case, it shows an inverse relationship with diversification. Moreover, it is seen to be statistically significant in 3 of the 4 equations in Table 7.1(e). Thus, we observe an inconsistent and weak relationship between these two variables.

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4. The only available comparative evidence in this regard is the study by Chaudhuri et al. (1982). They however, contended that regulatory legislations have acted as a major causal factor in inducing diversification among the firms in Indian corporate sector.

This is, however, not very surprising. For, a very weak relationship between diversification and the profitability of the firm has been found by other studies also.[5]

In general, the results described in this section have shown that the explanatory power of the determinants varies in different industries. Of the several determinants, the managerial excess capacity has been found to be more general as far as its influence on diversification is concerned. Overall, the results have validated the hypothesis concerning the unused/underutilized specific resources of the firm. Whether this will hold for a broader industry definition is to be seen in the next two sections.

7.3 THE REGRESSION RESULTS: 3-DIGIT LEVEL

Tables 7.2 (a) to 7.2 (e) exhibit the empirical results at the 3-digit level for Automobiles, General Engineering, Chemicals, Textile, and Sugar industries respectively.

Results in these tables seem to exhibit features more or less similar to those in the previous section. The overall proportion of explained variation in indices of diversification in the corresponding regressions is, however, lower in this set of results; though regressions are still significant in

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5. For example, Honeycutt and Zimmerman (1976, p. 529) and Gorecki (1978, p. 65) also obtained non-significant and conflicting coefficients on the profitability variable.

TABLE 7.2 (a)

Regression Results: 3-Digit Level, The Automobiles Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.057 (7.460)**	0.032 (4.005)**	0.002 (1.289)	0.004 (1.554)
EOS		-4.721 (-1.987)	1.176 (5.156)**	1.691 (4.639)**
SRS	-0.246 (-4.148)**	-0.215 (-3.544)*		
RRC	0.031 (3.648)*	0.041 (1.491)		
MEC	131.4 (2.400)*	186.9 (1.198)	27.82 (1.618)	40.97 (1.492)
CUR			-0.003 (-7.077)**	-0.004 (-6.351)**
MRT			-0.310 (-2.281)	-0.451 (-2.074)
$\bar{R}^2$	0.959	0.614	0.891	0.869
F-Ratio	61.74**	3.608	16.08**	13.07**
df.	6	5	5	5

TABLE 7.2 (b)

Regression Results: 3-Digit Level, The General Engineering Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.162 (3.712)**	0.103 (3.172)**	0.017 (4.374)**	0.033 (3.764)**
EOS	6.196 (4.080)**	3.047 (1.165)	0.543 (1.975)*	0.914 (1.465)
SRS				
RRC		-0.185 (-2.169)		
MEC		269.8 (1.777)	28.84 (1.593)	69.87 (1.804)
CUR	-0.028 (-1.689)	-0.046 (-3.034)**	-0.010 (-6.236)**	-0.018 (-5.045)**
MRT	-1.298 (-1.488)			-0.297 (-1.698)
$\bar{R}^2$	0.647	0.490	0.876	0.811
F-Ratio	8.480**	3.748*	30.88**	14.37**
df.	11	10	11	10

TABLE 7.2 (c)

Regression Results: 3-Digit Level, The Chemicals Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.245 (3.417)**	0.097 (2.076)*	0.014 (1.749)*	0.037 (2.500)*
EOS	2.262 (3.082)**	0.473 (1.108)	0.172 (2.247)*	0.354 (2.622)**
SRS	-1.197 (-3.095)**	-0.389 (-1.533)	-0.057 (-1.269)	-0.148 (-1.847)
RRC	0.075 (1.226)			
MEC		42.12 (1.174)	17.86 (2.771)**	22.85 (2.017)*
CUR				
MRT	2.244 (1.401)			
$\bar{R}^2$	0.736	0.375	0.732	0.707
F-Ratio	17.35**	5.430**	22.50**	19.85**
df.	21	22	22	22

TABLE 7.2 (d)

Regression Results: 3-Digit Level, The Textile Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.069 (3.458)**	0.047 (4.165)**	0.009 (4.835)**	0.016 (4.760)**
EOS	2.020 (1.017)	-2.898 (-2.549)**	-0.497 (-2.481)*	-0.726 (-2.105)*
SRS	-0.155 (-1.536)	-0.083 (-1.435)	-0.015 (-1.545)	-0.027 (-1.540)
RRC				
MEC	247.7 (1.895)*	214.0 (2.860)**	48.11 (3.651)**	79.87 (3.516)**
MRT				
$\bar{R}^2$	0.528	0.266	0.392	0.394
F-Ratio	8.430**	3.160*	5.134**	5.163**
df.	19	19	19	19

TABLE 7.2 (e)

Regression Results: 3-Digit Level, The Sugar Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number		
	DI 1	DB 2	DE 3
SAL	0.137 (1.922)*	0.001 (0.429)	0.007 (0.691)
EOS		0.792 (2.733)*	1.413 (2.123)*
SRS	0.807 (1.423)	0.096 (2.635)*	0.175 (2.095)
RRC	-0.230 (-1.672)	-0.024 (-2.913)*	-0.044 (-2.282)
MEC	605.3 (2.812)*	28.56 (1.706)	56.66 (1.475)
MRT			
$\bar{R}^2$	0.366	0.734	0.629
F-Ratio	2.686	8.048**	5.192*
df.	9	8	8

terms of the F-ratio except equation 1 in Table 7.2(e). As was the case with the results in the preceding section, there are notable differences in $\bar{R}^2$ values when alternate indices are used as the dependent variable. In particular, the equation using Gort Index as the regressand consistently shows a lower $\bar{R}^2$. With DI, on the other hand, the results are somewhat mixed.

In terms of the individual explanatory variables, firm size (SAL) shows a consistently positive and mostly strong relationship with the dependent variable. The relationship between the two yields a similar pattern across different samples, excepting the Automobiles industry where it is somewhat more pronounced than was evidenced by the 4-digit level regressions.

Economies of scope variable, on the other hand, though still positive in most regressions, shows a negative association with diversification in equations 2, 3, and 4 in the case of Textile industry. The reason for this result is not clear.

With respect to the managerial excess capacity as a determinant, we observe that the results are commensurate with our a priori expectations. In the case of the Automobiles industry, the relation is somewhat weaker than that at the 4-digit level. For the Chemicals industry this variable appears in these results though it was not present in the corresponding results at the 4-digit level.

Akin to the results described in the previous section, the coefficient on the capacity utilization rate is negative and significantly so.

For other variables, we observe the following: the MRT dummy variable does not show up as a significant one in any of the regressions. The coefficient on the profitability (RRC) variable, whenever present has a more likely positive sign on it, except in the case of the Sugar industry. Similarly, SRS has a negative but insignificant association with diversification in all cases.

In general, the results of the analysis at the 3-digit level of industry classification are broadly consistent with our predictions concerning determinants of diversification.

7.4 THE REGRESSION RESULTS: 2-DIGIT LEVEL

This section deals with the interpretation of the regression results at the 2-digit level of industry classification which are given in Tables 7.3(a) to 7.3(e).

For the results based on industry specific samples at the 2-digit level, we find the proportion of explained variance by the corresponding equations to be more than what was observed at the 3-digit level, but more or less the same with that at the 4-digit level. This goes to suggest that the results obtained by conducting the analysis at the 3-digit level will generally be poorer compared to the other two levels. Thus, the choice of the level of classification

TABLE 7.3(a)

Regression Results: 2-Digit Level, The Automobile Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.004 (0.305)	0.027 (6.743)**	0.003 (3.243)**	0.006 (3.258)**
EOS	5.884 (4.193)**	2.786 (2.693)*		
SRS			-0.015 (-1.370)	-0.025 (-1.285)
RRC	0.037 (2.490)*		0.014 (5.590)**	0.021 (4.719)**
MEC		-108.8 (-1.380)		
CUR	-0.008 (-4.810)**	-0.004 (-2.232)*	-0.001 (-6.802)**	-0.002 (-5.691)**
MRT	1.512 (2.838)*			
R^2	0.977	0.796	0.901	0.868
F-Ratio	80.59**	10.63**	24.06**	17.59**
df.	5	6	6	6

TABLE 7.3 (b)

Regression Results: 2-Digit Level, The General Engineering Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.066 (4.078)**	0.039 (3.835)**	0.012 (4.030)**	0.022 (4.361)**
EOS	2.504 (2.251)*	1.121 (1.588)	0.588 (2.882)**	0.847 (2.443)*
SRS				
RRC				
MEC	138.1 (1.886)*	79.06 (1.700)	24.26 (1.806)*	45.97 (2.012)*
CUR	-0.029 (-4.285)**	-0.026 (-6.212)**	-0.010 (-8.256)**	-0.016 (-7.839)**
MRT				
$\bar{R}^2$	0.922	0.855	0.924	0.917
F-Ratio	51.79**	25.97**	53.21**	48.08**
df.	11	11	11	11

TABLE 7.3(c)

Regression Results: 2-Digit Level, The Chemicals Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.058 (1.397)	0.026 (1.243)	-0.007 (-1.525)	-0.012 (-1.861)*
EOS	1.472 (3.433)**	0.339 (2.568)**		
SRS	-0.453 (-2.011)	-0.145 (-1.116)		
RRC	0.175 (3.445)**		0.009 (1.317)	0.018 (1.937)
MEC			11.86 (1.664)	16.13 (1.667)
CUR	-0.014 (-2.405)*			
MRT	2.272 (2.464)*	1.014 (1.932)	0.325 (1.548)	0.578 (2.025)
$\bar{R}^2$	0.855	0.216	0.429	0.531
F-Ratio	29.06**	2.835	6.630**	9.693**
df.	20	22	22	22

TABLE 7.3 (d)

Regression Results: 2-Digit Level, The Textile Industry, 1978

Explanatory Variable	Dependent Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.056 (4.528)**	0.031 (4.005)**	0.007 (4.144)**	0.012 (4.236)**
EOS		-1.844 (-2.376)*	-0.424 (-2.251)*	-0.562 (-1.895)*
SRS	-0.139 (-1.983)	-0.045 (-1.152)	-0.010 (-1.144)	-0.017 (-1.182)
RRC	0.067 (2.200)*			
MEC	186.5 (2.873)**	139.5 (2.731)**	44.98 (3.630)**	69.28 (3.547)**
MRT				
$\bar{R}^2$	0.589	0.231	0.388	0.404
F-Ratio	10.61**	2.732	5.056**	5.367**
df.	19	19	19	19

TABLE 7.3 (e)

Regression Results: 2-Digit Level, The Sugar Industry, 1978

Explanatory Variable	Dependant Variable and Equation Number			
	DI 1	DG 2	DB 3	DE 4
SAL	0.048 (1.466)	0.018 (1.034)	0.441×10^{-3} (0.110)	0.001 (0.127)
EOS	12.42 (4.937)**		0.840 (3.219)**	1.650 (2.994)**
SRS		0.543 (3.933)**	0.088 (2.667)*	0.142 (2.043)
RRC	-0.102 (-2.112)	-0.080 (-2.406)*	-0.024 (-3.171)*	-0.040 (-2.468)*
MEC	198.0 (1.475)	90.42 (1.723)	29.22 (1.939)*	53.85 (1.692)
MRT				
$\bar{R}^2$	0.819	0.586	0.784	0.739
F-Ratio	16.96**	5.711*	10.36**	8.239**
df.	9	9	8	8

seems to matter, howsoever insignificantly. At any rate, it is clear that empirical analysis of the determinants of diversification if conducted at the 3-digit level in addition to the other two levels, does not add to or subtract from the conclusions already arrived at by conducting the analysis at the 4-digit and the 2-digit levels of industry classification.

In other respects, the results can be seen to be similar to those in section 7.2, with one notable difference. Some of the variables, particularly the MEC, are observed to decline with respect to their statistical significance. This is quite in agreement with our view that, at a broader level of classification, the effect of excess capacity related determinants will be somewhat diminished due to the difficulties which may be experienced in adapting the resources for the production of rather dissimilar products.

7.5 CONCLUDING REMARKS

In sum, the regression results based on industry specific samples discussed in this chapter have highlighted the following. Firstly, the determinants of diversification are somewhat sensitive to the level of industry classification. Secondly, the explanatory power of the independent variables, at all levels of classification, is sensitive to the index of diversification selected as the dependent variable. Thirdly, the most consistently significant determinants were

firm size, managerial excess capacity, economies of scope and the capacity utilization rate. The influence of the MEC variable declined with the increasing broadness of the classification. Similarly, as was expected, there were differences in the significance of the explanatory variables across different industry samples.

In the next chapter, we will attempt to find further support for the propositions of this study.

CHAPTER 8

THE EMPIRICAL FINDINGS : POOLED CROSS-SECTION RESULTS

8.1 INTRODUCTION

The regression results obtained for the pooled-samples of companies are reported and analysed in this chapter. The nature and scope of the analysis presented here differs from the industry specific regression analysis in many respects. Firstly, the analysis in the preceding chapter was of exploratory character, whereas the endeavour here is directed at getting more general results. Thus, instead of estimating all possible regressions and reporting the best among them, a single equation incorporating as many determinants of diversification as possible has been estimated and analysed. This is likely to yield two advantages:

(a) It will enable us to ascertain more precisely the relative importance of various determinants.

(b) It will lead to a more definitive resolution of the issues with regard to the choice of the diversification measure and the selection of the industry level at which diversification should be defined.

It should be noted that we arrived at certain conclusions regarding these issues on the basis of industry specific results of the regression analysis. But those conclusions can at best be regarded as tentative in nature. For, unless the same explanatory variables are used in the estimated equation,

having different dependent variables, no statistically valid conclusions can be drawn on the appropriateness of a particular dependent variable. That is to say, a comparison of $\bar{R}^2$ values for the purpose of choosing the most appropriate dependent variable (diversification index) is not justified unless the above criterion is met with. Thus, in order to evaluate the appropriateness of diversification indices on the basis of their empirical performance, all the nine indices of diversification have alternately been employed as the dependent variable in the estimated equations. Similarly, the regression analysis is conducted at different levels of classification with a view to ascertain the suitability of industry level for the purpose of the study of diversification.

Secondly, the model has been extended by including the primary industry related variables. These variables are: concentration in the primary industry of the firm, and the firm's primary industry growth rate. The advertising Intensity (ADI) variable, which could not be included in the industry specific analysis due to data limitations, has been included in the specification. But, at the same time, the Economies of Scope (EOS) variable is omitted from the analysis because, firms in a pooled sample across different industries are likely to be more heterogeneous with respect to the degree of vertical integration. Since the EOS variable has been defined as the ratio of value added to raw material consumed, it is possible that it is unduly affected by the

degree of vertical integration. In other words, the measurement of this variable may be rendered inaccurate. It was therefore felt that it would be pragmatic to exclude this variable in a pooled-sample analysis.

Four different regression equations, already specified in chapter 6, were estimated for pooled-samples consisting of 140, 59, 81, and 27 companies respectively. The regression results obtained for various pooled-samples are presented and analysed in the following sections.

Before proceeding, we would like to mention that, as was the case with the industry specific samples, a considerably significant degree of variability was noticed across the pooled-samples. Hence, even a broadly consistent pattern in the results for various samples analysed can be regarded as a support for the propositions advanced in this study.

8.2 THE REGRESSION RESULTS: 140 COMPANIES SAMPLE

Tables 8.1(a) to 8.1(c) present the regression results for the sample of 140 companies at the 4-, 3-, and 2-digit level respectively.

For the sample of 140 companies, the seven explanatory variables explained between 35.4 per cent and 64.0 per cent of the variance in the indices of diversification at the 4-digit level. The proportions of explained variation to the total variation in percentage terms ranged between 25.3 and

TABLE 8.1(a)

Regression Results: 4-Digit Level, 140 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI	DS	DG	DB	NE (DB)
	1	2	3	4	5
SAL	0.092 (5.571)**	0.003 (2.211)*	0.022 (1.942)*	0.005 (3.176)**	0.029 (4.040)**
SRS	-0.111 (-1.042)	-0.123×10^{-3} (-0.013)	0.021 (0.283)	-0.003 (-0.317)	-0.016 (-0.357)
RRC	0.047 (1.389)	0.003 (1.292)	0.011 (0.468)	0.004 (1.511)	0.021 (1.454)
MEC	110.0 (2.421)**	14.09 (3.736)**	95.11 (2.947)**	14.17 (3.235)**	96.25 (4.833)**
CON	0.031 (4.040)**	0.002 (4.170)**	0.011 (2.160)*	0.003 (4.856)**	0.012 (3.609)**
GR3	0.541×10^{-3} (1.840)	0.420×10^{-5} (0.173)	0.262×10^{-4} (0.125)	0.202×10^{-4} (0.713)	0.428×10^{-4} (0.332)
MRT	1.790 (3.596)**	0.086 (2.112)*	0.521 (1.476)	0.134 (2.799)**	0.490 (2.250)*
$\bar{R}^2$	0.551	0.590	0.354	0.615	0.633
F-Ratio	29.13**	33.96**	13.43**	37.67**	40.54**

contd...

(TABLE 8.1(a) contd..)

Explanatory Variable	Dependent Variable and Equation Number			
	DU	DE	NE (DE)	DT
	6	7	8	9
SAL	0.030	0.010	0.036	0.016
	(4.443)**	(3.159)**	(4.044)**	(3.733)**
SRS	-0.019	-0.005	-0.022	-0.010
	(-0.444)	(-0.276)	(-0.380)	(-0.377)
RRC	0.019	0.009	0.025	0.012
	(1.394)	(1.385)	(1.393)	(1.451)
MEC	91.61	28.46	105.2	47.43
	(4.868)**	(3.261)**	(4.269)**	(3.997)**
CON	0.011	0.006	0.015	0.004
	(3.682)**	(4.241)**	(3.574)**	(2.288)*
GR3	0.653×10^{-4}	0.443×10^{-4}	0.916×10^{-4}	0.214×10^{-5}
	(0.537)	(0.785)	(0.575)	(0.027)
MRT	0.517	0.260	0.682	0.381
	(2.509)*	(2.723)**	(2.529)*	(2.937)**
$\bar{R}^2$	0.640	0.583	0.606	0.546
F-Ratio	41.72**	33.05**	36.20**	28.56**

TABLE 8.1(b)

Regression Results: 3-Digit Level, 140 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI 1	DS 2	DG 3	DB 4	NE (DB) 5
SAL	0.105 (8.343)**	0.004 (3.343)**	0.034 (4.450)**	0.005 (3.956)**	0.036 (6.195)**
SRS	-0.122 (-1.501)	-0.001 (-0.236)	-0.003 (-0.061)	-0.003 (-0.336)	-0.033 (-0.888)
RRC	0.017 (0.681)	0.003 (1.469)	0.005 (0.366)	0.004 (1.303)	0.020 (1.743)
MEC	97.90 (2.819)**	17.03 (5.046)**	77.53 (3.658)**	18.46 (4.472)**	89.72 (5.603)**
CON	0.021 (3.711)**	0.649×10^{-3} (1.129)	0.001 (0.461)	0.001 (2.191)*	0.005 (2.087)*
GR3	0.290×10^{-3} (1.291)	-0.190×10^{-4} (-0.870)	-0.100×10^{-3} (-0.734)	-0.130×10^{-4} (-0.490)	-0.107×10^{-4} (-0.103)
MRT	0.871 (2.291)*	0.050 (1.358)	-0.002 (-0.008)	0.083 (1.849)	0.326 (1.863)
$\bar{R}^2$	0.483	0.523	0.242	0.535	0.620
F-Ratio	22.34**	26.08**	8.608**	27.37**	38.46**

contd...

(TABLE 8.1(b) contd..)

Explanatory Variable	Dependent Variable and Equation Number			
	DU 6	DE 7	NE (DE) 8	DT 9
SIL	0.037 (6.781)**	0.012 (4.616)**	0.044 (6.290)**	0.011 (3.913)**
SRS	-0.035 (-1.001)	-0.007 (-0.399)	-0.038 (-0.824)	-0.007 (-0.409)
RRC	0.017 (1.523)	0.005 (0.890)	0.020 (1.378)	0.007 (1.369)
MEC	83.46 (5.565)**	32.87 (4.291)**	96.48 (4.945)**	33.37 (4.310)**
CON	0.006 (2.402)**	0.002 (2.070)*	0.007 (2.320)*	0.988×10^{-3} (0.748)
GR3	0.793×10^{-5} (0.081)	-0.116×10^{-4} (-0.235)	0.559×10^{-5} (0.044)	-0.180×10^{-4} (-0.361)
MRT	0.338 (2.063)*	0.130 (1.555)	0.394 (1.846)	0.246 (2.904)**
$\bar{R}^2$	0.624	0.485	0.575	0.495
F-Ratio	39.06**	22.55**	32.01**	23.36**

TABLE 8.1(c)

Regression Results: 2-Digit Level, 140 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI	DS	DG	DB	NE (DB)
	1	2	3	4	5
SAL	0.073	0.003	0.017	0.005	0.028
	(7.957)**	(2.754)**	(4.338)**	(3.491)**	(6.352)**
SRS	-0.124	-0.002	-0.008	-0.004	-0.038
	(-2.081)*	(-0.382)	(-0.332)	(-0.491)	(-1.314)
RRC	0.033	0.003	0.009	0.003	0.023
	(1.751)	(1.391)	(1.147)	(1.321)	(2.558)*
MEC	71.55	12.27	28.18	15.12	53.07
	(2.805)**	(3.844)**	(2.483)**	(3.829)**	(4.240)**
CON	0.010	-0.589×10^{-3}	-0.002	-0.581×10^{-3}	0.003
	(2.456)**	(-1.082)	(-1.136)	(-0.864)	(1.752)*
GR3	0.203×10^{-3}	-0.976×10^{-5}	-0.322×10^{-4}	-0.500×10^{-5}	0.393×10^{-4}
	(1.232)	(-0.473)	(-0.439)	(-0.196)	(0.486)
MRT	1.234	0.126	0.493	0.160	0.681
	(4.418)**	(3.609)**	(3.969)**	(3.705)**	(4.968)**
$\bar{R}^2$	0.546	0.421	0.320	0.427	0.646
F-Ratio	28.50**	17.60**	11.69**	18.01**	42.92**

contd...

(TABLE 8.1(c) contd.)

Explanatory Variable	Dependent Variable and Equation Number			
	DU 6	DE 7	NE (DE) 8	DT 9
SAL	0.028 (6.779)**	0.009 (4.080)**	0.034 (6.477)**	0.005 (3.510)**
SRS	-0.037 (-1.368)	-0.008 (-0.588)	-0.043 (-1.253)	-0.004 (-0.470)
RRC	0.020 (2.333)*	0.006 (1.302)	0.024 (2.249)*	0.003 (1.320)
MEC	51.78 (4.426)**	23.94 (3.713)**	58.79 (4.032)**	15.01 (3.798)**
CON	0.004 (2.175)*	-0.761×10^{-3} (-0.692)	0.003 (1.552)	-0.568×10^{-3} (-0.843)
GR3	0.455×10^{-4} (0.601)	-0.684×10^{-6} (-0.016)	0.529×10^{-4} (0.569)	-0.499×10^{-5} (-0.195)
MRT	0.647 (5.050)**	0.274 (3.885)**	0.781 (4.895)**	0.161 (3.728)**
$\bar{R}^2$	0.660	0.432	0.616	0.427
F-Ratio	45.46**	18.33**	37.73**	17.97**

62.4 at the 3-digit level. Similarly, percentages at the 2-digit level are 32.1 and 66.0 respectively. Relatively lower proportions of the explained variances at the 3-digit level indicate that this level of industry classification may not be very suitable for a study of diversification. However, a close similarity in the explained variations at the 4-digit and the 2-digit level is somewhat surprising. For, many economists have suggested that a broader level of classification is unsuitable for the measurement of product diversification.[1] The reason for this can be ascertained by closely examining the coefficient of variations of different indices at varying levels of classification in chapter 5, Table 5.1. We find that the 2-digit indices exhibit a relatively less variability compared to those at the other two levels.

At a given level of classification, the use of different indices as the dependent variable seems to affect the overall significance of the regression equations. In particular, use of the Gort index as a regressand can be observed to result in significantly lower values of $\bar{R}^2$. On the other hand, there is a close similarity in explained variations in the Utton index, Numbers-Equivalent (Berry), and Numbers-Equivalent (Entropy). Besides, these indices seem to give best results in terms of the significance of the regression equations. With regard to other indices, we notice that DB and DE, and

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1. For example, refer to Shepherd (1970).

to some extent DS also yield,more or less similar results. The close similarity in explained variance of DS and DB is consistent with Gorecki's (1978) results.

A poor performance of the Gort index in these results is in opposition with the results obtained by Honeycutt and Zimmerman (1976, Table 5, p. 529) for a sample of 79 large US Corporations. In their study (although not strictly comparable with ours since the former was conducted at the finer 5-digit level of US industrial classification) the equation utilizing Gort index as the dependent variable yielded the highest $\bar{R}^2$ value. However, for other indices, results seem to be broadly consistent with ours.

With respect to the performance of the indices of diversification, we notice that some of them, especially the Gort index and to some extent gravity index yield poor results. Hence, Caves' (1977b) observations, in this context, that the choice of the index does not affect the levels of significance are not in accordance with our findings. Rather, the findings seem to agree with Gorecki (1978).

In terms of the individual explanatory variables, the most consistently significant variables are the firm size and managerial excess capacity which always have the expected positive coefficient at all levels of industry classification. With regard to concentration, we observe that it possesses the posited positive sign at the 4-digit level and is significant. However, significance of this variable goes down

as we proceed from the narrower to the broader level of classification.

Another variable which has a positive association with diversification is the MRT dummy variable. This variable is consistently significant at the 4-digit and the 2-digit level. However, we do not find it to be significant at the 3-digit level excepting equations 1, 6, and 9. Thus, we find that various regulatory measures have, in fact, had some positive effect on the degree of diversification.

With regard to the other independent variables, the coefficient on shareholders' reserves and surplus (SRS) is negative throughout but insignificant. This somewhat unexpected sign of the SRS variable can be explained as follows. It is quite possible that any substantial diversification move in the past might have resulted in the capitalization of reserves in order to augment the equity capital base. This enlarged equity base would have enabled the firm to raise a larger amount of loanable funds, than what it could have been with the initial equity base, in view of the institutionally determined leverage. It also indicates the risk-averse nature of the management with regard to the use of internally generated funds in risky ventures. It is clear from this that the availability of internal funds is not an important factor for these firms in so far as diversification is concerned.

The profitability of the firm (RRC) is found to be positively associated with diversification but significantly so in only some equations at the 2-digit level. Thus, while the firm may not so much as care to use internal funds for financing expansion/diversification projects, it is anxious to fare well in the 'market test' so as to be able to raise finances whenever the need arises. Previous studies found the firm's profitability as insignificant and with conflicting relationships.[2]

The primary industry growth rate (GR3) is not significant in any of the equations. Besides, while it has a positive coefficient at the 4-digit level, it acquires a negative sign at both the 3-digit and the 2-digit level results. Further, both the magnitude of the coefficient and its significance are very low. This confirms our earlier view that this determinant might not be relevant in the case of a heavily regulated economy like ours where firms are, by and large, unable to respond freely to various 'market signals', due to regulatory constraints.

For the 2-digit level results, we notice that equations 4 and 9 show almost identical results. This, however, is solely due to the fact that at the 2-digit level the Berry index and the Gravity index, the way it is defined here, would have the same values. Therefore, their use as the dependent

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2. See Gorecki (1978) and Hassid (1975).

variable will yield the same result.[3]

The overall empirical results for this sample are quite satisfactory. Especially, the results have lent considerable support for our major hypothesis regarding the managerial excess capacity. Another feature of these results is that we have found a statistically significant association between diversification and concentration. It should be noted that previous studies have mostly recorded insignificant result for the concentration variable.

8.3 THE REGRESSION RESULTS: 59 COMPANIES SAMPLE

This section presents the regression results for the sample of 59 companies. For these regressions, the Advertising Intensity (ADI) variable was also included in the specification. However, the regression analysis in this case was conducted for only 4-digit and 2-digit level of industry classification. Table 8.2 (a) and Table 8.2 (b) show the results of the analysis at the 4-digit and the 2-digit level respectively.

All the regressions in these tables are significant at .01 level of significance. However, whereas the proportion of explained variation declines somewhat from the 4-digit to the 2-digit level in the case of equations 2, 3, 4, 7, and 9, an opposite trend is seen for the remaining equations. In

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3. Hence, equation 9 is not presented in the subsequent 2-digit level regression results tabulations.

TABLE 8.2 (a)

Regression Results: 4-Digit Level, 59 Companies, 1978

Explanatory variable	Dependent Variable and Equation Number				
	DI 1	DS 2	DG 3	DB 4	NE (DB) 5
SAL	0.013 (0.322)	-0.239×10^{-4} (-0.006)	-0.010 (-0.338)	0.611×10^{-3} (0.141)	0.013 (0.677)
SRS	0.081 (0.317)	0.004 (0.176)	0.080 (0.392)	0.004 (0.158)	-0.011 (-0.092)
RRC	0.080 (1.363)	0.007 (1.375)	0.011 (0.253)	0.010 (1.734)	0.035 (1.201)
MEC	102.6 (1.246)	3.845 (0.508)	88.51 (1.351)	3.632 (0.416)	85.03 (2.076)*
CON	0.031 (2.762)**	0.002 (2.530)**	0.013 (1.452)	0.003 (2.919)**	0.009 (1.702)*
GR3	-0.160×10^{-3} (-0.377)	-0.493×10^{-4} (-1.267)	-0.470×10^{-3} (-1.394)	-0.375×10^{-4} (-0.837)	-0.242×10^{-3} (-1.149)
MRT	0.919 (1.030)	0.088 (1.081)	0.225 (0.317)	0.108 (1.145)	0.217 (0.489)
ADI	223.5 (2.445)**	19.07 (2.271)*	167.4 (2.301)*	19.74 (2.038)*	19.53 (1.990)*
$\bar{R}^2$	0.678	0.585	0.446	0.629	0.641
F-Ratio	18.02**	12.32**	7.405**	14.62**	15.40**

contd....

(TABLE 8.2 (a) contd.)

Explanatory Variable	Dependent Variable and Equation Number			
	DU 6	DE 7	NE (DE) 8	DT 9
SAL	0.012 (0.667)	0.504×10^{-3} (0.057)	0.011 (0.468)	0.002 (0.258)
SRS	-0.006 (-0.056)	0.010 (0.190)	0.575×10^{-3} (0.003)	0.013 (0.181)
RRC	0.034 (1.245)	0.017 (1.390)	0.042 (1.174)	0.038 (2.285)*
MEC	81.62 (2.140)*	17.58 (0.997)	102.1 (2.043)*	24.96 (1.078)
CON	0.009 (1.771)*	0.006 (2.476)**	0.012 (1.815)*	0.002 (0.674)
GR3	-0.194×10^{-3} (-0.991)	-0.699×10^{-4} (-0.770)	-0.235×10^{-3} (-0.914)	-0.106×10^{-3} (-0.893)
MRT	0.237 (0.574)	0.157 (0.825)	0.266 (0.491)	0.182 (0.725)
ADI	82.60 (1.949)*	37.63 (1.921)*	102.2 (1.841)*	32.80 (1.275)
$\bar{R}^2$	0.657	0.609	0.637	0.560
F-Ratio	16.41**	13.52**	15.13**	11.21**

TABLE 8.2 (b)

Regression Results: 2-Digit Level, 59 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI 1	DS 2	DG 3	DB 4	NE (DB) 5
SAL	0.038 (2.308)*	0.700×10^{-3} (0.244)	0.008 (0.818)	0.001 (0.342)	0.016 (1.570)
SRS	-0.070 (-0.668)	0.002 (0.120)	0.001 (0.028)	0.003 (0.147)	-0.026 (-0.404)
RRC	0.104 (4.343)**	0.011 (2.883)**	0.037 (2.625)*	0.015 (2.956)**	0.056 (3.742)**
MEC	100.5 (2.998)**	2.837 (0.492)	17.90 (0.899)	4.850 (0.676)	29.27 (1.390)
CON	0.002 (0.566)	-0.001 (-1.617)	-0.004 (-1.757)*	-0.001 (-1.635)	-0.264×10^{-3} (-0.089)
GR3	0.157×10^{-3} (0.915)	-0.108×10^{-4} (-0.365)	-0.259×10^{-4} (-0.252)	-0.139×10^{-4} (-0.378)	-0.960×10^{-5} (-0.088)
MRT	-0.152 (-0.420)	0.110 (1.763)	0.224 (1.041)	0.107 (1.385)	0.481 (2.109)*
ADI	-22.53 (-0.605)	0.049 (0.007)	-8.535 (-0.385)	1.689 (0.212)	10.40 (0.444)
$\bar{R}^2$	0.777	0.487	0.410	0.488	0.732
F-Ratio	29.19**	8.577**	6.509**	8.615**	23.11**

contd...

(TABLE 8.2 (b) contd.)

Explanatory Variable	Dependent Variable and Equation Number		
	DU 6	DE 7	NE (DE) 8
SAL	0.016 (1.696)*	0.002 (0.477)	0.017 (1.489)
SRS	-0.026 (-0.439)	0.003 (0.891)	-0.026 (-0.342)
RRC	0.051 (3.754)**	0.024 (2.880)**	0.063 (3.620)**
MEC	32.41 (1.691)*	13.62 (1.144)	39.75 (1.638)
CON	0.952×10^{-3} (0.354)	-0.002 (-1.604)	-0.501×10^{-3} (-0.147)
GR3	-0.303×10^{-5} (-0.030)	-0.150×10^{-4} (-0.246)	-0.119×10^{-4} (-0.095)
MRT	0.398 (1.919)	0.118 (0.921)	0.422 (1.605)
ADI	9.536 (0.447)	0.778 (0.058)	11.90 (0.441)
$\bar{R}^2$	0.751	0.488	0.714
F-Ratio	25.39**	8.615**	21.15**

particular, we find that the equations with DU, NE(DB), and NE(DE) consistently exhibit this pattern. The same phenomenon was also observed in the previous section.

With respect to the choice of the index, the results are comparable with those obtained for the 140 companies sample. The explained variance in the Gort index can be seen to be less than is the case with other indices of diversification. Similarly, proportion of explained variation is more or less the same in the case of DU, NE(DB), and NE(DE).

Among the explanatory variables, managerial excess capacity always has the predicted positive association with diversification at both the 4-digit and the 2-digit level. However, the statistical significance of the coefficient of this variable appears to decline at the broader level of classification. Thus, the result obtained for this variable is in agreement with our proposition, that the application of the unused specific resources will generally be restricted to somewhat closely related 4-digit industries.

The most striking feature of these results is an evidence of strong positive relationship between advertising intensity and diversification. The coefficient of the ADI variable is consistently significant at 95 per cent level or more at the 4-digit level. Furthermore, it is not significant at the broader (2-digit) level of classification. Thus, this result underscores our view that the influence of

advertising generated intangible assets (resources) will diminish at the broader level of industry classification, due to the smaller likelihood of the applicability of such underutilized assets across distantly related product lines. Thus, the finding with respect to the ADI variable is a positive one. Some of the early studies have failed to get a statistically significant result for this variable.[4]

We also observe a positive association between diversification and concentration. Similarly, as has been the case in the previous section, the effect of concentration is diminished at the 2-digit level. In this case, however, it is due to the use of product market concentration ratios in this study. Probably with more accurate values of the concentration ratios this trend may not be observed.

Both at the 4-digit and the 2-digit level, the results show that the rate of profitability has the more likely positive coefficient and is consistently significant at 99 per cent level in the 2-digit regressions. With respect to the SRS variable, no significant result is seen. Similar results can be observed for the Growth Rate variable.

A notable feature of the results is the presence of a rather weak relationship between the firm size and diversification, particularly at the 4-digit level. This suggests that

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4. Studies by Hassid (1975) and Gorecki (1978) can be cited as examples in this context.

the relationship between the two may not be stable in different samples. Likewise, we do not find a statistically significant coefficient on the MRT dummy variable.

On the whole, the results presented in this section are mostly in accordance with our *a priori* expectations.

8.4 THE REGRESSION RESULTS: 81 COMPANIES SAMPLE

As was mentioned in chapter 6, sub-sample 2, consisting of 81 companies, facilitated testing yet another firm specific variable, namely the Capacity Utilization Rate (CUR) in the specification. However, for this sample, the ADI variable was dropped from the specification due to paucity of the data.

The regression results for the sample of 81 companies are shown in Table 8.3(a) (4-digit level) and Table 8.3(b) (2-digit level).

The results of the regression analysis in these tables show that the proportion of explained variation in the indices of diversification varies between 0.471 and 0.75 at the 4-digit level. The corresponding figures at the 2-digit level are 0.517 and 0.838. Thus, the overall significance of the equations is by far the largest.

Regarding the choice of the index of diversification, the results are analogous to those presented earlier.

In terms of the individual explanatory variables the most consistently significant is the capacity utilization rate,

TABLE 8.3(a)

Regression Results: 4-Digit Level, 81 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI 1	DS 2	DG 3	DB 4	NE(DB) 5
SAL	0.038 (1.444)	-0.001 (-0.757)	0.004 (0.227)	-0.544×10^{-3} (-0.220)	-0.582×10^{-3} (-0.048)
SRS	-0.046 (-0.343)	0.006 (0.668)	0.032 (0.314)	0.005 (0.451)	0.021 (0.358)
RRC	0.132 (2.123)*	0.014 (2.800)**	0.054 (1.137)	0.019 (3.362)**	0.064 (2.307)*
MEC	1.334 (0.024)	4.154 (0.942)	37.56 (0.900)	1.660 (0.333)	47.03 (1.953)*
CON	0.019 (1.571)	0.001 (1.481)	0.003 (0.385)	0.002 (2.278)*	0.003 (0.709)
GR3	0.030 (3.533)**	0.002 (3.599)**	0.019 (3.028)**	0.002 (3.331)**	0.014 (3.914)**
MRT	1.682 (2.183)	0.047 (0.764)	0.606 (1.022)	0.072 (1.020)	0.327 (0.958)
CUR	-0.020 (-2.898)**	-0.002 (-3.468)**	-0.014 (-2.671)**	-0.002 (-3.841)**	-0.007 (-2.505)**
$\bar{R}^2$	0.672	0.720	0.471	0.750	0.735
F-Ratio	23.95**	29.85**	10.88**	34.78**	32.21**

contd....

(TABLE 8.3(a) contd.)

Explanatory Variable	Dependent Variable and Equation Number			
	DU 6	DE 7	NE(DE) 8	DT 9
SAL	0.001 (0.152)	0.879×10^{-3} (0.171)	0.004 (0.290)	0.004 (0.735)
SRS	0.018 (0.325)	0.008 (0.340)	0.020 (0.270)	0.008 (0.263)
RRC	0.061 (2.367)*	0.034 (2.875)**	0.079 (2.299)*	0.059 (3.758)**
MEC	45.31 (2.022)*	5.693 (0.550)	46.47 (1.554)	14.66 (1.075)
CON	0.004 (0.822)	0.004 (1.947)*	0.007 (1.014)	0.002 (0.744)
GR3	0.013 (3.871)**	0.004 (3.057)**	0.016 (3.522)**	0.005 (2.345)*
MRT	0.338 (1.063)	0.165 (1.127)	0.489 (1.150)	0.127 (0.659)
CUR	-0.007 (-2.562)**	-0.004 (-3.660)**	-0.010 (-2.765)**	-0.006 (-3.659)**
R^2	0.745	0.707	0.710	0.688
F-Ratio	33.92**	28.06**	28.56**	25.80**

TABLE 8.3(b)

Regression Results: 2-Digit Level, 81 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI 1	DS 2	DG 3	DB 4	NE(DB) 5
SAL	0.036 (3.290)**	0.001 (0.774)	0.012 (2.021)*	0.002 (1.021)	0.006 (1.158)
SRS	-0.080 (-1.421)	-0.001 (-0.111)	-0.013 (-0.438)	-0.001 (-0.090)	-0.015 (-0.501)
RRC	0.109 (4.170)**	0.015 (3.425)**	0.044 (3.146)**	0.019 (3.693)**	0.065 (4.743)**
MEC	27.07 (1.194)	4.655 (1.204)	6.235 (0.507)	4.890 (1.051)	15.67 (1.306)
CON	0.011 (2.264)*	-0.935×10^{-3} (-1.038)	-0.002 (-0.861)	-0.001 (-1.073)	-0.600×10^{-3} (-0.214)
GR3	0.002 (0.582)	0.917×10^{-3} (1.507)	0.002 (1.347)	0.001 (1.678)	0.007 (3.960)**
MRT	0.543 (1.687)	0.072 (1.326)	0.344 (1.972)	0.074 (1.127)	0.474 (2.779)**
CUR	-0.006 (-2.235)*	-0.001 (-3.340)**	-0.005 (-3.355)**	-0.002 (-3.406)**	-0.004 (-3.125)**
$\bar{R}^2$	0.767	0.563	0.517	0.576	0.824
F-Ratio	38.10**	15.41**	12.93**	16.17**	53.95**

contd...

(TABLE 8.3 (b) contd.)

Explanatory variable	Dependent Variable and Equation Number		
	DU 6	DE 7	NE (DE) 8
SAL	0.006 (1.225)	0.005 (1.401)	0.010 (1.470)
SRS	-0.012 (-0.463)	-0.003 (-0.198)	-0.016 (-0.477)
RRC	0.057 (4.547)**	0.031 (3.734)**	0.072 (4.563)**
MEC	18.48 (1.699)*	8.101 (1.103)	17.71 (1.280)
CON	0.237×10^{-3} (0.093)	-0.001 (-0.877)	-0.763×10^{-3} (-0.236)
GR3	0.006 (4.022)**	0.001 (1.557)	0.007 (3.639)**
MRT	0.435 (2.817)**	0.129 (1.165)	0.496 (2.523)*
CUR	-0.004 (-2.826)**	-0.003 (-3.426)**	-0.005 (-3.050)**
$\bar{R}^2$	0.838	0.588	0.805
F-Ratio	59.38**	16.94**	47.64**

which is seen to have a predicted negative association with diversification at the 4-digit level. However, the relationship between the two is somewhat more pronounced in few equations at the 2-digit level.

The other significant variable in these results is the rate of the profitability. It is observed to possess the expected positive link with diversification. Also, this variable is more significant at the 2-digit level. Managerial excess capacity variable is positive throughout but is statistically significant in a few equations only.

The relationship between diversification and concentration does not appear to be of much significance. Nevertheless, the relationship is still positive throughout at the 4-digit level. The MRT dummy variable has a positive coefficient and is significant in equations 5 and 6 at the 2-digit level. Thus, there is no evidence of a well defined relationship between the two.

By far, the most remarkable result is seen with respect to the Growth Rate (GR3) variable. So far, it only exhibited a weak and conflicting relationship. But in this set of results, this variable is statistically significant at 99 per cent level at the 4-digit level. Although the coefficient of GR3 is not significant in 5 of the 8 equations, it still has a positive sign at the 2-digit level.

With regard to other variables, the results obtained are of little consequence and therefore, do not warrant much

discussion.

8.5 THE REGRESSION RESULTS : 27 COMPANIES SAMPLE

For the 27 companies, data on all the explanatory variables was available. Thus, this sample was utilized in estimating the regression equations with nine variables in the specification. However, computations for this sample were done at the 4-digit only. As the sample size is rather small, not much confidence can be placed in the findings of this section. The regression results for the sample of 27 companies are reported in Table 8.4.

Broadly, the results in Table 8.4 exhibit patterns which are similar to those in the earlier section. Thus, managerial excess capacity is positive in all equations, although significantly so in only 3 equations. Similarly, we find diversification to be positively associated with the CON variable. However, it is not significant in any of the regressions.

For the CUR variable, there is seen a strong inverse relationship, as expected. Furthermore, it is significant at 99 per cent level everywhere. The coefficient of the advertising intensity variable is positive all along and is significantly so in 5 regressions.

Yet another variable which is statistically significant with a proper sign is the profitability variable. The firm size, however, has a sign contrary to the general pattern

TABLE 8.4

Regression Results: 4-Digit Level, 27 Companies, 1978

Explanatory Variable	Dependent Variable and Equation Number				
	DI 1	DS 2	DG 3	DB 4	NE (DB) 5
SAL	-0.115 (-1.808)*	-0.006 (-1.252)	-0.073 (-1.347)	-0.006 (-1.255)	-0.038 (-1.190)
SRS	0.822 (1.859)	0.041 (1.231)	0.532 (1.405)	0.052 (1.363)	0.281 (1.269)
RRC	0.252 (2.396)*	0.025 (3.130)**	0.195 (2.169)*	0.031 (3.473)**	0.138 (2.624)*
MEC	149.8 (1.165)	10.87 (1.101)	136.1 (1.234)	10.11 (0.909)	125.6 (1.950)*
CON	0.055 (1.243)	0.004 (1.277)	0.018 (0.490)	0.005 (1.529)	0.013 (0.600)
GR3	-0.003 (-0.172)	0.001 (0.674)	0.185×10^{-3} (0.010)	0.001 (0.557)	0.003 (0.367)
MRT	-2.192 (-1.664)	-0.172 (-1.707)	-2.956 (-2.618)*	-0.178 (-1.562)	-1.668 (-2.528)*
CUR	-0.044 (-3.235)**	-0.005 (-5.042)**	-0.034 (-2.951)**	-0.006 (-5.356)**	-0.021 (-3.129)**
ADI	552.0 (2.728)**	19.21 (1.237)	383.7 (2.213)*	22.50 (1.285)	180.8 (1.784)*
R^2	0.849	0.865	0.723	0.880	0.838
F-Ratio	18.21**	20.58**	8.886**	23.58	16.86**

contd...

(TABLE 8.4 contd.)

Explanatory Variable	Dependent Variable and Equation Number			
	DU 6	DE 7	NE (DE) 8	DT 9
SAL	-0.037 (-1.269)	-0.016 (-1.299)	-0.050 (-1.312)	-0.009 (-0.611)
SRS	0.281 (1.385)	0.123 (1.446)	0.375 (1.407)	0.115 (1.098)
RRC	0.130 (2.702)*	0.063 (3.119)**	0.172 (2.712)*	0.101 (4.052)**
MEC	119.2 (2.022)*	31.83 (1.280)	149.3 (1.925)*	42.94 (1.408)
CON	0.014 (0.697)	0.011 (1.290)	0.020 (0.758)	0.010 (1.013)
GR3	0.002 (0.275)	0.830×10^{-3} (0.202)	0.002 (0.162)	-0.428×10^{-3} (-0.085)
MRT	-1.521 (-2.519)*	-0.527 (-2.073)*	-2.056 (-2.587)*	-0.660 (-2.116)*
CUR	-0.020 (-3.263)**	-0.012 (-4.705)**	-0.028 (-3.400)**	-0.018 (-5.555)**
ADI	175.5 (1.893)*	61.19 (1.564)	234.7 (1.923)*	57.77 (1.204)
$\bar{R}^2$	0.850	0.849	0.839	0.860
F-Ratio	18.29**	18.25**	16.87**	19.76**

evidenced in this chapter so far. But it is statistically not significant. Similarly, the MRT dummy variable shows a negative relationship with diversification. Moreover, it is significant at .05 level in some equations.

8.6 CONCLUSIONS

In this penultimate chapter, we presented and discussed the empirical results for various pooled samples of companies. The following salient points can be inferred from the analysis.

(a) We have seen that results are susceptible to the level of industry classification at which diversification is defined. This has become amply clear by the changing magnitudes of the coefficients on various explanatory variables. The results have pointed out that, as far as the determinants are concerned, it is better to use the 4-digit level of classification. However, with a view to gain a better understanding of the patterns of diversification, it is desirable to conduct the analysis at both 4-digit and 2-digit levels of classification. The analysis at the 3-digit level - which is between the narrower and the broader levels - does not seem to serve any useful purpose.

(b) The empirical results do seem to be responsive to the index of diversification used. In particular, Gort index has not been found to be a suitable measure in this study. From this vantage point, Utton Index and Numbers Equivalent counterparts of Berry Index and Entropy index have

yielded the best and, almost similar results.

(c) As far as the determinants of diversification are concerned, we have established that firm-specific characteristics seem to affect diversification to a great extent. In fact, there is much justification in saying that the firm specific determinants are more important than either the environmental factors or industry specific factors, in explaining the diversification of firms. The most partinent among the firm specific variables are the size, managerial excess capacity, advertising intensity, and the capacity utilization rate. Hence, the specific asset hypothesis, in all its manifestations, is far more important than regulatory controls themselves.

CHAPTER 9

SUMMARY AND CONCLUSIONS

9.1 A RECAPITULATION

In the introduction to this study, we took a note of the apparently growing instances of product diversification by large firms (which had begun to be documented elsewhere) in the Indian corporate sector. We further observed that, despite the increasing economic significance of diversified firms, the subject had received very little general empirical attention in our context. This study was thus undertaken with a view to contribute some more empirical evidence in this field. However, in view of the vastness of the subject, we confined ourselves to the analysis of the following aspects of diversification;

(a) to make a quantitative evaluation of the extent of diversification, both at a point of time and over time.

(b) to identify, develop, and analyse the factors which may affect the degree of diversification. In this context, however, we have sought to emphasize the role of firm specific characteristics.

In contrast to most previous studies of diversification, which either relied upon census industry averages or samples of a few of the largest firms, this study made use of firm level data for a sample of 140 public limited companies - irrespective of their size. Also, in contrast to most of the

previous studies, the data base used has certain advantages with respect to the measurement of diversification.

This study has made use of nine often used and important measures of diversification in the calculation of output diversity of firms. This was done with a view to bring out the differences and similarities in different indices, for none of the measures developed in the literature could be said to be superior to others on a conceptual basis. For the measurement of indices, a profile of the sales by products was made for each firm at the 4-, 3-, and 2-digit level of the National Industrial Classification for the years 1974 through 1979.

With respect to the determinants of diversification, we have attempted to formulate a general model of diversification by applying the central idea of the Penrosian (1959) theory of the growth of the firm and integrating it with the specific asset hypothesis of Gorecki (1975). In brief we have postulated that, over time as the management of the firm (in the broadest sense) gains experience within the firm, its capacity to extract realisable services from other resources is enhanced; thus, with the passage of time unused and/or underutilized services will emerge; this excess capacity (it can emerge in many functional divisions of the firm) acts, as an incentive for undertaking new projects, since it cannot be traded in the market due to its specificity.

The above mentioned idea was utilized in advancing a hypothesis relating to excess capacity; whether managerial, physical or advertising generated in nature. In addition, certain other hypothesis were used from the established works on the determinants of diversification.

Various hypotheses were empirically tested by conducting cross-section regression analysis both for industry specific samples and pooled samples of companies in the private manufacturing sector.

9.2 MAJOR FINDINGS

The important findings with regard to the extent of diversification for a sample of 140 companies are:

(a) the sample companies on the average were found to have produced in 5.8, 4.8, and 3.4 distinct NIC codes at 4-, 3-, and 2-digit level of industry classification respectively, in 1978. Thus, the degree of diversification exhibited by the sample companies was not very much. However, the proportions of secondary output which were 36.1 per cent, 31.5 per cent, and 23.7 per cent at the 4-, 3-, and 2-digit level, showed that despite the fewness of industries, the secondary activities were generally important to the sample firms. This was reflected by other indices as well.

(b) For the sample companies as a whole, a greater part of the overall diversification was into broader 2-digit industry groups. The proportion of the 2-digit to the

4-digit diversification in terms of Entropy Index was about 60 per cent. This suggested that diversified firms have preferred to move into somewhat distantly related industries instead of utilizing full scope of their primary 2-digit industry.

(c) Within the sample, there were considerable variations in the diversity of the individual firms. In general, a majority of the firms were concentrated in the lower tail of the distributions by different indices. Further, there was seen an unevenness in the size distribution of the products of companies.

(d) Industry-wise diversification has revealed that diversification was usually more in the relatively slow growing or stagnant industries. For example, on the average, sample firms in the Sugar industry were diversified into 6.3 four-digit industries. Another feature was that firms in such industries had moved into unrelated 2-digit industry groups. For example, many firms in the Textile industry had mostly diversified into Chemicals and Cement industry. A substantial difference in the indices between the 2-digit level and the 4-digit level in the case of Chemicals and General Engineering industries suggested that the activities of companies in these industry groups were mainly limited to a narrow range of related products (that is, adjacent 4-digit industry codes within a 2-digit industry).

(e) Changes in the indices of diversification between 1974 and 1979 pointed toward an increasing trend in diversification. Thus, even as the period of the study was short, different indices registered an increase, varying from 2.7 per cent to 7.4 per cent at the 4-digit level. Interestingly enough, the increase in the corresponding indices at the 2-digit level were greater than at the 4-digit level. This implied that these firms tended to diversify more into unrelated 2-digit codes.

The main findings concerning the relative importance of various determinants of diversification, proposed and empirically tested in this study, can be summarized as follows.

(a) Regression analysis based on a cross-section of industry-wise samples and pooled samples of companies established that firm specific variables were more important than other categories of determinants as causal factors in explaining the degree of firm-level diversification.

(b) Among the firm-specific determinants the managerial excess capacity - which was defined as the ratio of the expenditure on managerial personnel and the net sales of the firm - was observed to have a positive association with diversification. The significance of the relationship between the two, however, varied in different samples.

(c) The economies of scope, analyzed for industry specific samples only, exhibited a positive and strong relation with

the level of diversification, excepting the Textile industry. Further, the relationship was more pronounced at the 4-digit level regressions as was expected.

(d) Firm size and diversification were found to possess a positive relationship. However, in contrast to some previous studies, the association was not found as a strong one.

(e) For the capacity utilization rate - used as a proxy for the underutilized physical resources of the firm - we found a negative causation as postulated. Furthermore, it was seen to be highly significant in all cases.

(f) With respect to the advertising intensity, a positive relationship was obtained at the 4-digit level of industry classification. But in accordance with our view that advertising generated resources could mostly be expected to be transferable across closely related products, the influence of this variable diminished with the increasing broadness of the classification.

(g) A very weak negative effect was observed for the shareholders' reserves and surplus variable. This indicated that internally generated financial resources are not an important factor, as far as diversification is concerned. The profitability of the firm, on the other hand, was found to exhibit a positive relationship with diversification. However, the relationship was not observed to be consistently significant.

(h) With respect to the primary industry variables, the growth rate was not found to be related to diversification at all. Besides, the signs on this determinant pointed toward the possible existence of a conflicting relationship between growth and diversification.

(i) Firm level diversification was seen to have a strong positive link with the concentration of the primary industry at the 4-digit level.

(j) A positive sign on the MRT dummy variable, used as a 'catch-all' for the effect of regulatory policies, showed that regulated companies were systematically more diversified than the unregulated companies. However, in the presence of a high correlation between MRT and firm size, no definite conclusion could be drawn about the effect of regulation on the degree of diversification.

(k) The overall significance of regression equations at the varying levels of classification indicated that analysis at the 4-digit level and the 2-digit level yielded better results.

(l) Lastly, empirical results were found to be affected by the use of alternate indices of diversification. Specifically, the use of Gort index resulted in rather poor results. Significantly enough, hitherto unused indices, such as the Numbers-Equivalent (Berry) and the Numbers Equivalent (Entropy) along with Utton index yielded the best results.

In sum, the findings with respect to the determinants were consistent with the hypotheses as proposed in the study, and they were also broadly in agreement with the results of the previous studies on this subject.

9.3 POLICY IMPLICATIONS

The findings of this study can be used to derive some policy implications.

(a) As has emerged from the analysis, one of the foremost factors prompting diversification is the firm's keenness to exploit its unused/underutilized resources. Thus, from the point of efficiency, diversification has much to be recommended. The governmental licensing policy with regard to diversification/expansion by large firms has, however, been generally characterized by selective granting of approvals in predetermined lines of production only. As such these firms were not allowed to move into products for which they may have developed distinct competence. Thus, from the view of better resource utilization, the licensing authorities would do well to allow diversification proposals which entail the use of internally generated skills and resources, irrespective of the ownership status of the firm.[1]

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1. Though not tested here the argument can be applied equally well to R and D activities of the firm.

(b) Similarly, we have seen that diversification is spurred by underutilized productive capacity, especially when it is persistent over time. It should be recalled that this use of spare production capacity was stated to be more feasible in cases where productive equipment can be adapted to the production of different products. In this context, the government has already permitted diversification primarily in the engineering based industries. There is, however, a need for extension of this 'broad-banding' policy to other industries also.

(c) While there is a case for a more liberal attitude toward diversification, at the same time, however, due care should be taken to ensure that it does not result in excessive foreign collaborations and over investment. As it were, unrelated diversification accounted for a high proportion (60 per cent) of the total diversification by sample companies. It is highly unlikely that the whole of it could have been a consequence of regulatory policies or firm's ability in transferring its unused/underutilized resources, across diverse products. A significant part of it was due to liberal policies with respect to foreign collaborations, import of technical know-how and imports in the form of semi-knocked down or completely knocked down condition, which resulted in diversification into the so called 'screw-driver' technology based product lines. Obviously enough, this pattern of diversification, unless accompanied by timely import

substitutions and adaptation of technologies, will lead to a frittering away of resources, and therefore, should not be encouraged.

9.4 SUGGESTIONS FOR FURTHER RESEARCH

Some of the earlier research has indicated that target or secondary industry related variables could be important in determining the patterns of diversification. However, such variables were not considered in the empirical formulation of determinants of diversification in this study. Primarily, we were more concerned with developing a model for explaining the extent of diversification, and secondly, due to some severe limitations with respect to the availability of data. Nevertheless, it is expected that more comprehensive models will be able to consider this class of variables as well.

Among firm specific determinants, certain considerations compelled us to ignore the research and development variable. These considerations were

(i) available evidence suggested that R and D accounted for a tiny fraction of the firm's total outlays in the corporate sector, implying thereby that R and D activities were not significantly important in a majority of firms,

(ii) whatever little R and D efforts existed were mostly confined to adaptation of foreign technologies. That is to say, efforts in this regard were of imitative rather than innovative nature. Naturally, this type of R and D activity

could not have resulted in any significant 'spin-offs' with respect to new products and processes,

(iii) in many cases R and D expenditures were not reported by companies. However, of late, one can discern a significant change in the attitude of the corporate sector toward the importance of R and D. Thus, future research would do well to utilize this information also.

There is a scope for the improvements with regard to organization of samples. In particular, it would be interesting to find if the same model can be utilized for explaining diversification of public sector companies and private sector private Ltd. companies, especially the former in view of their different nature and objectives. Furthermore, the analysis should also be conducted on the basis of disaggregated samples of indigenous and foreign-owned companies. Efforts may also be directed at putting together parent and subsidiary units for this purpose.

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